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Solano County Solid Waste Management Plan Revision

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SOLANO COUNTY
SOLID WASTE MANAGEMENT PLAN
REVISION

AUGUST 1988

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Revision

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Adoption by Solano County Cities Completed, June 14, 1988
Approved by California Waste Management Board, August 10, 1989

1989 Amendment

Adopted by Solano County Board of Supervisors, September 12, 1989
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Approved by California Waste Management Board, November 8, 1989

Prepared by Solano County Department of Environmental Management

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TABLE OF CONTENTS

CHAPTER		PAGE
I	INTRODUCTION	
	Purpose	I-1
	Relationship to Other Plans	I-1
	Public Participation	I-2
	Format	I-3
II	SOLID WASTE FACILITIES AND PRACTICES	
	Storage of Solid Waste	II-1
	Collection	II-2
	Disposal	II-2
III	PRODUCTION, COMPOSITION AND PROJECTIONS	
	Characteristic Change since 1984	III-1
	Waste Categories	III-2
	Waste Projection Factors	III-6
	Waste Projections	III-14
	Land Requirements	III-22
IV	RESOURCE RECOVERY ELEMENT	
	Policies and Program	IV-1
	Resource Recovery Background	IV-20
	Alternatives	IV-38
V	ALTERNATIVE PLAN ANALYSIS	
	Issues Raised	V-1
	Description of Alternatives	V-3
	Alternatives Evaluated	V-9
	Recommendation	V-19
VI	SOLID WASTE FACILITIES PLAN	
	Short Term Plan	VI-2
	Medium Term Plan	VI-7
	Long Term Plan	VI-8

CHAPTER		PAGE
VII	PLAN IMPLEMENTATION	
	Existing System	VII-1
	Organization for Plan Administration	VII-5
	Plan Implementation Tasks	VII-7
	Short Term Costs	VII-7
	Financing the Short Term Plan	VII-7
	Importation of Municipal Wastes	VII-11

APPENDICES

A	Present Recovery Practices	A-1
B	Resource Recovery Systems	B-1
C	Disaster Contingency Plan	C-1
D	Enforcement Program	D-1
E	Importation Ordinance	E-1

FIGURES

FIGURE		PAGE
II-1	Collection Area Boundaries	II-3
II-2	Disposal Sites Serving the County	II-4
III-1	Flow of Refuse	III-9
IV-1	History of PG&E Avoided Cost Prices	IV-34
V-1	Alternative A - Replacement of Sites	V-5
V-2	Alternative B - Consolidate to Two Sites	V-8
VI-1	Facilities Element Implementation	VI-3
VI-2	Waste Disposal Facility Implementation Plan Map	VI-4
D-1	Environmental Health Division Organization Chart	

TABLES

TABLE		PAGE
II-1	Status of Solid Waste Disposal Sites	II-5
II-2	Summary of Wastes Received	II-6
III-1	Composition of Waste	III-3
III-2	Household Hazardous Waste - Current	III-5
III-3	Household Hazardous Waste - Projected	III-6
III-4	Population	III-12
III-5	Solid Waste Received at Sites	III-13
III-6	Municipal Waste Projection	III-16

TABLE		PAGE
III-7	Agricultural Waste Projection	III-18
III-8	Special Wastes Projection	III-19
III-9	Summary Waste Projections	III-23
III-10	Landfill Volume Requirements	III-24
III-11	Cumulative Landfill Volume Requirements	III-24
IV-1	Present Resource Recovery Practices	IV-16
IV-2	Recycling Goals	IV-19
V-1	Cost Summary for Alternative Plans	V-10
V-2	Collection - Disposal Costs	V-12
VII-1	Collection and Disposal Charges	VII-3
VII-2	Existing and Proposed Waste Flow	VII-4
VII-3	Tasks, Costs and Assignments	VII-8
VII-4	Revenue-Expense Projection	VII-9

I. INTRODUCTION

Purpose

State law requires that County Solid Waste Management Plans be reviewed at least every three years and revised where necessary to be consistent with State policy. Solano County submitted its plan review report to the State Solid Waste Management Board in March 1987. In July 1987, the State Board reviewed the report and found that the following aspects of the County's plan needed to be updated and revised to bring the Plan into full compliance with State policy and the Planning Guidelines:

- Identify existing and future solid waste quantities and types
- Provide for collection or drop off for disposal at a hazardous waste facility of household hazardous wastes and asbestos wastes if such a program is needed
- Update inventory of existing solid waste disposal sites and future disposal alternatives
- Update the resource recovery element
- Update the plan's economic feasibility information for revised plan proposals
- Update the enforcement program
- Update the implementation schedule

Relationship to Other Plans

This document provides an update of the Solano County Solid Waste Management Plan approved by the State in 1978 and the update approved in February 1984. It replaces the Facilities, Resource Recovery and Implementation Elements of the original 1978 plan and 1984 Revision and updates those other Chapters which have become out of date or require expansion. All of the elements of a

waste management plan are contained in this update so that the previous plans need be consulted only for a more complete description of the County's setting, Solid Waste Management System, future resource recovery systems, and institutional alternatives.

Subsequent to adoption of the 1984 Solid Waste Plan Update, the County has updated other plans and programs which have a bearing on the Solid Waste Management System. In February 1984, the County's Land Use and Circulation Element was amended to designate existing and proposed waste disposal sites. In June of 1984 the voters adopted a referendum deleting the proposed Lynch Canyon Landfill site from the General Plan.

In 1986 hazardous waste planning legislation (AB 2948 Tanner) was adopted by the State. This legislation establishes a comprehensive approach to the problem of planning and siting new hazardous waste facilities. Solano County has elected to prepare a Comprehensive Hazardous Waste Plan under the provisions of this law. The Plan will contain an analysis of the hazardous waste stream, a determination of the need for facilities to manage the waste and an identification of potential sites for new facilities siting criteria. The final plan is expected to be adopted in September 1988 after ratification by a majority of the cities containing a majority of the population of the County's incorporated areas. This plan, once adopted, will replace the Hazardous Waste Management Element which is a part of the 1984 Solid Waste Management Plan.

Public Participation

The process which has led to the release of the Draft Plan Revision has provided the public, the waste industry and ratifying agencies with considerable opportunity to affect the contents of this document. Beginning with the plan review report prepared in February 1987, public participation has been solicited through a variety of techniques. Letters requesting identification of changes in the waste system and issues to be considered were sent

to cities, the industry and other interested parties prior to preparation of the plan report and the Plan Revision. Preparation of the draft was guided by a Technical Advisory Committee. The Resource Recovery Element was drafted by the County's Resource Recovery Advisory Committee. The Preliminary Draft Plan Revision has been widely circulated for public comment and during the review period a public forum will be held.

A considerable number of written comments were received from requests for comments on plan update issues and the Administrative Draft. These dealt with a variety of matters ranging from minor textual corrections to suggestions for major changes in the plan concept. All comments received were carefully considered and most of the suggested changes have been incorporated into this document.

Based on the previous certified Solid Waste Management Plan EIR, a Negative Declaration was prepared for the current Plan update. The Negative Declaration was circulated for public review. Comments received have been considered in preparing the Final Plan Draft. The Negative Declaration together with comments was approved by the Board of Supervisors on March 15, 1988.

Public hearings were held before the Solano County Board of Supervisors on the Plan Report prior to its submittal to the State. A further hearing was held on Final Draft Plan Revision document prior to its release to the cities for approval, and during the ratification process additional hearings were held by each of the cities prior to taking action on the plan. Final public hearings were held before the Board of Supervisors and the California Waste Management Board at the time of adoption.

Format

The format for the Solid Waste Plan Revision follows that of the original plan. Chapter II, Solid Waste Facilities and Practices, summarizes changes in the storage and collection system and provides an updated description of the disposal facilities described in Chapter III of the 1984 plan revision. Chapter III provides

an update of the Solid waste Production, Composition and Projections contained in the original plan.

Chapter IV contains the revised Resource Recovery Element. Alternative Plans for Solid Waste Facilities, Chapter V, contains the analysis of different disposal site configurations available to the County and the rationale used in selecting the favored facilities plan. Chapter VI is a revision and update of the Recommended Plan for Solid Waste Disposal and includes an expanded discussion of Solid Waste Disposal after a natural disaster.

In the 1984 Revision, the discussion of hazardous wastes and their disposal was contained in a Hazardous Waste Management Element. A subsequent state law, adopted in 1986, provided for these matters to be discussed in a comprehensive Hazardous Waste Management Plan to be separately processed. The Hazardous Waste Management Element has been removed from the plan and is being prepared as a separate document.

The final Chapter contains the Implementation Program with a summary of the institutional organization for waste disposal, a schedule of plan implementation tasks, an updated enforcement program, plan financing, and a discussion of waste importation.

II. SOLID WASTE FACILITIES AND PRACTICES

During the period since adoption of the original plan and its 1984 update, the major elements of the Solid Waste Storage, Collection and Disposal System have remained unchanged; however, a number of changes have taken place which may have some impact on the system's future. Improvements have been made in regulations governing storage and collection practices; a new disposal site has been opened and others have undertaken closure activities. These changes are outlined in the following section.

Storage of Solid Waste

Provision for safe and adequate storage facilities and the use of proper types of storage containers is important to efficient collection. Requirements for the storage of solid waste, container size and frequency of collection are designated by City and County Solid Waste Ordinances. The Cities and the County also require new commercial and industrial developments to submit plans that provide for adequate solid waste storage.

Solano County's solid waste ordinance was reviewed and modified in 1980. This ordinance controls storage enclosures for solid waste containers, refuse collection by commercial operators, transportation, solid waste vehicle inspections, disposal sites, and refuse collection areas in the unincorporated areas of the County. It also mandates collection in the congested areas of the unincorporated areas of the County.

During the ordinance revision, the County Division of Environmental health reviewed local storage and collection practices. The results of the review were incorporated into improved waste handling requirements in the ordinance update. The Division also worked with the cities to promote improved commercial waste storage practices and to incorporate more stringent storage requirements into city ordinance updates. Following this, revisions to the Suisun City, Vallejo, Rio Vista, Dixon and Vacaville Codes were adopted.

In the past, the most significant problem in the storage of solid waste was garbage overflow from inadequate containers and irregular pick up. This problem, which was identified in the original Solid Waste Plan, has been largely alleviated by City and County ordinance updates and particularly by provision for mandatory collection in all areas.

Collection

The collection and disposal of solid wastes within Solano County is accomplished by six privately owned, city franchised refuse collectors who operate in the incorporated and unincorporated areas. The refuse collectors contract for designated collection areas and provide service at the frequency required by the client up to once a day. A County permit is required for collection vehicles operated in the specific collection areas. Current collection areas are shown on Figure II-1. No major changes have taken place in the pattern of collection services in the County overall since adoption of the 1984 waste plan revision although increases in monthly service charges have occured.

Disposal

All solid waste collected in Solano County is disposed of in sanitary landfills, modified sanitary landfills or in evaporative ponds. Sites currently serving Solano County are shown on Figure II-2 and their characteristics are summarized in Table II-1 with updated information about size, capacity, and remaining life. The types of waste disposed at these sites is shown in Table II-2 which has been updated to reflect data pertinent to each site.

Of the nine disposal sites serving Solano County, six are located within the County. All of the sites are privately owned, with the exception of the Mare Island disposal site owned and operated by the U.S. Government and the Rio Vista site on land which the city leases from the state.

Some changes in the status of solid waste disposal sites serving Solano County have occurred since the 1984 plan. The new Potrero

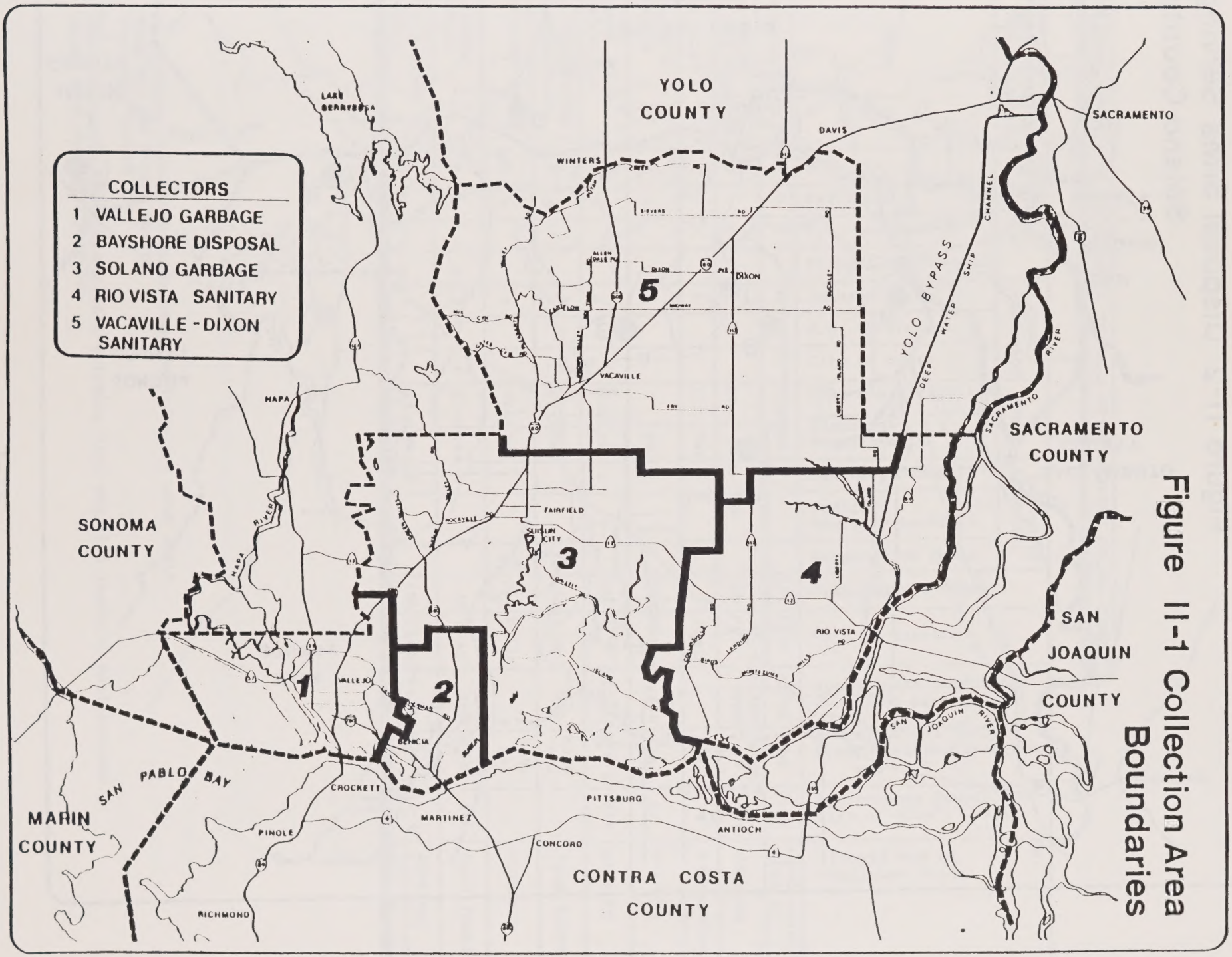

Figure II-1 Collection Area Boundaries

Figure II-2 Disposal Sites Serving Solano County

Table II-1 STATUS OF SOLID WASTE DISPOSAL SITES SERVING SOLANO COUNTY

Disposal Site Identification		Owner			Operator			RWQCB		Method of Disposal			Total Site Acreage	Type of Terrain	Approximate Remaining Capacity, 1000 Cubic Yards	Average Total Daily Quantities Received, tons[a]	Approximate Remaining Life of Site[a], years	Planned Use of Completed Fill
Name	Code	Private	U.S. Government	City(C) or State(S)	Private	U.S. Government	City or State	Site Classification	Discharge Requirements	Sanitary Landfill	Modified Sanitary Landfill	Evaporative Ponds						
American Canyon[b]	A	X			X			IIId.	Yes	X			122	Flat	2,742	300	8-10	Open space/ grazing
Mare Island Sanitary Landfill	B		X		X	X		II-1	No		X		20	(80 for expansion) Flat	364	45	20+	Unknown
Acme Fill[b.]	C	X			X			III	Yes	X				Flat		46	2	Recreation
Redwood[b.] Landfill	D	X			X				No	X			522	Flat	7,600	45	23	Unknown
Potrero Hills Landfill	E	X			X			IIId.	Yes	X			320	slop-ing	16,936	890 e.	70+	grazing
I.T. Corporation Montezuma Hills	F	X			X			II-1	Yes			X	50	Flat	208	6000 bbl		Open Space
Aqua-Clear Farms	G	X			X			II-1	Yes			X	110	Hills		1300 bbl	8	Unknown
Rio Vista Landfill	H			S	X		C	II-2	Yes	X			20	Flat	285	15	14	Open Space
B & J Dropbox Landfill	I	X			X			II-2	Yes	X			161	Flat	9,194	160	43-47	Grazing/ Agriculture

a. At existing waste generation rates on 7-day per week basis
b. Site outside Solano County
c. Presently closed

d. New Site Classification replaces existing II-1 and II-2 landfill designations
e. Based upon one year operation

Table II-2 SUMMARY OF WASTES RECEIVED AT DISPOSAL SITES SERVING SOLANO COUNTY

Disposal Site Identification		Type of Solid Waste														
		Municipal										Other				
Name	Code	Residential	Commercial	Institutional	Street Refuse	Dead Animals	Industrial	Construction & Demolition	Sewage Residue	Litter	Hazardous	Infectious	Asbestos	Agricultural	Special	On-Site Salvage
American Canyon	A	X	X	X	X	X	X	X	X	X				X	X	
Mare Isl. Sanitary Landfill	B		X		X		X	X		X	X					
Acme Fill	C	X	X	X	X	X	X	X		X					X	X
Redwood Landfill	D	X	X	X	X	X	X	X	X	X						
Potrero Hills, Inc. Landfill	E	X	X	X	X	X	X	X	X	X				X		X
IT Corporation Montezuma Hills	F						X								X	
Aqua Clear Farms	G						X								X	
Rio Vista Landfill	H	X	X	X		X				X						X
B & J Dropbox Landfill	I	X	X	X	X	X	X	X	X	X		X	X	X	X	X

Hills Landfill serving the Fairfield-Suisun Area opened in 1986. The California Medical Facility landfill site in Vacaville off Peabody Road was closed. Residential wastes from Travis Air Base which previously were disposed at the Redwood Disposal Site in Marin are now disposed at the Potrero Hills Site, and residential wastes from Mare Island have been shifted from Yolo County to the Redwood site.

With the opening of the Potrero Hills Landfill, closure activities have been undertaken at the Solano Garbage Company disposal site on Highway 12.

Various other changes in disposal sites and operations which have occurred since the 1984 Solid Waste Plan Revision, such as expansions, re-engineering of sites and changes in the waste stream flow, result in the need to update site descriptions. Changes which have affected site operation and capacities are outlined below:

American Canyon (A) (Close 11/93)

The American Canyon Site is located in the southern part of Napa County between the Napa River and State Highway 29 and incorporates approximately 122 acres. It is operated by the American Canyon Development Company, Inc. and serves 150,000 people in Vallejo and Napa and the surrounding unincorporated areas in Solano and Napa Counties.

An area fill method is used for disposal. Approximately 200 tons per day of municipal solid wastes are received at the site from Solano County alone, with most of these wastes coming from the nearby City of Vallejo.

Current recycling operations include paper, cardboard, glass and aluminum which are stored in debris boxes and removed at frequent intervals. The operators have installed a 1.5 mega watt landfill gas recovery system, and the energy is sold to PG&E. Improvements made to the site since the 1978 plan inventory include construction of an all weather entry road, improved

drainage facilities, and flood protection levees. Disposal operations have also been upgraded in accordance with recommendations presented in a soil consulting firm's report.

In the past, disposal potential at the site was limited pending deliberations over the issuance of an Army Corps of Engineers permit. Those matters were resolved in 1982 with issuance of a Corps permit which allows disposal to continue on 122 acres of the total 311 acre ownership, but also carries a requirement to seek an upland replacement for the landfill. The remaining 189 acres were deeded to State for open space.

Because the landfill site is located in Napa County, there may be some unforeseen institutional constraints in the future that must be considered in an analysis of its potential viability for the long-term solid waste disposal needs of Vallejo. With respect to the actual availability of the site, Napa County has granted the discharger a use permit to operate indefinitely.

The anticipated site life is approximately 8-10 years. Under present circumstances, site closure could be expected towards the end of the medium term planning period, about 1995. However, if the proposal to establish a replacement site in Napa County is approved, this site could remain open indefinitely for limited public dumping. When closed, the site would be used for open space grazing.

American Canyon Replacement Site

This proposed site is located in Southeastern Napa County, four miles east of the existing American Canyon Sanitary landfill. Access to the site is via a private road which leaves State Highway 29 just south of Napa junction. The site is proposed for about 800 acres and would be developed by American Canyon Development Company, Inc. The site would serve the City of Napa and southern Napa County and the City of Vallejo and southern Solano County. The site would be permitted as a Class III site.

Mare Island (B)

This landfill is located on the naval base in Vallejo. The only source of waste is from the facilities on the base. No salvage operations are practiced at the site.

Shipyard activities at the Base generate non-hazardous general construction wastes as well as flammable and other solid and liquid hazardous wastes. The disposal operation involves a 30 acre landfill and four surface impoundments. The current landfill is located within the boundaries of an older landfill utilized since the 1940's. The land fill contains hazardous waste mixed with debris and other fill material.

The disposal site is operated under interim status pursuant to Environmental Protection Agency (EPA) and California Department of Health Services (DHS) regulations in accordance with the U.S. Resource Conservation and Recovery Act (RCRA). In 1988, the EPA and DHS began joint hearings to consider permit denial. If made final, the permit denial would require the current disposal site operations to cease and closure of the facilities would commence. In this case, neither the class I hazardous wastes, nor class III construction wastes would be landfilled at the site. The shipyards hazardous wastes will have to be disposed of off the naval base at a class I disposal site. The shipyards hazardous waste disposal needs are addressed in the County hazardous waste (Tanner Plan). Another location on the base for a disposal site for the class III construction wastes is being considered by shipyard authorities.

Solano County Landfill

This site which was owned and operated by Braito Enterprises was located east of Columbus Parkway off of I-780. The property is now in the city limits of Benicia. The site has been closed since 1978 under the closure procedures established by the San Francisco Regional Water Quality Control Board. It is being used as open space.

Acme Fill (C)

This site is a Class III landfill located on I-680 just outside of the City of Martinez in Contra Costa County. In addition to serving Central Contra Costa County, Antioch, and the Rodeo area, the site serves as the landfill for refuse from the City of Benicia and surrounding area in Solano County.

The Acme fill is privately owned and operated facility having a total area of 516 acres with approximately 97 acres presently in use. About 1300-1500 tons of solid waste are received daily at the site, making it one of the largest operations in the Bay area.

Newspaper, cardboard, metals, scrap aluminum and glass are hand separated at the site by Acme staff.

The U.S. Army Corps of Engineers Permit on the 97 acre parcel was to expire June 15 1987. However, a recent approval by the Corps allows the height of the landfill to be raised from 40 to 60 feet and the site life to be extended to June 1989. This site was expected to be available for waste disposal until 1994. A Closure plan for the 97 acre parcel is being developed for submittal in July 1988. Solano County will be affected by closure of the site, in that Benicia will have to locate another site in Contra Costa County to continue export of wastes, or else haul to a site in Solano County.

Redwood Landfill (D)

The Redwood Landfill is located in the northern part of Marin County off US-101 near the Marin County Airport. In addition to serving most of urbanized Marin County, the site serves as the landfill for residential wastes generated by the Mare Island Naval Shipyard in Solano County.

The site accepts approximately 495 tons of waste a day including 45 tons from Mare Island. It is anticipated that the site has sufficient capacity to operate until 1997.

IT Corporation, Benicia Facility

The landfill is a Class I hazardous waste disposal site of about 242 acres located in a relatively hilly area northeast of Benicia. Hazardous waste sites are no longer governed by the County Solid Waste Plan. Hazardous waste disposal is addressed in the County Hazardous Waste (Tanner) Plan.

Potrero Hills Landfill (E)

The facility is located in the Potrero Hills one mile south of Route 12. Access is off Kildeer Road via a newly constructed road through the old Solano Garbage Company Landfill.

The Potrero Hills Landfill has been developed by Potrero Hills Landfill, Inc. on a 320 acre parcel as a replacement site for the Solano Garbage Company Facility. The site serves Fairfield, Suisun and the surrounding unincorporated areas of Solano County. On an interim basis, the site also accepts waste from Benicia and up to a maximum of 88,500 tons per year from Contra Costa County.

Potrero Hills Landfill is a canyon type operation which currently receives an average of 500 tons of municipal solid waste per day (seven day basis). Municipal solid wastes and sewage sludge from Benicia could bring an additional 80 to 100 tons per day to the site. Presently the site could reach a maximum site depth of 160 feet, provide 17 million cubic yards of disposal capacity, and serve the County into the second quarter of the 21st Century. Potrero Hills has recently purchased an additional 210 acres which if appropriate approvals are received would expand the site to 530 acres and increase its capacity to 27 million cubic yards of refuse. Engineering studies are also underway to determine if additional disposal capacity could be obtained through site design modifications thus providing both extra disposal space and additional cover soil.

As proposed, annual waste imports from Contra Costa will bring an additional 240 tons per day averaged over a twelve month period

or 1100 tons per day averaged over a two and one half month period. Imports from Contra Costa County are limited to a three (3) year period 1989-1992 while that County completes efforts to establish a site within its own jurisdiction. The waste received from Contra Costa County would be transported from a transfer station near Martinez to Potrero Hills by fully enclosed transfer vehicles with approximately a 20 ton capacity. Transfer vehicles will travel by designated routes and will be restricted to off peak travel times. Additional personnel and equipment will be added to the site to accommodate the increased loads. No hazardous wastes are to be imported. Over the three (3) year period that Contra Costa County Waste is imported, up to 390 thousand cubic yards (130,000 cubic yards per year) would be brought to the site. This waste would reduce existing site capacity by approximately 2.5%.

Site features include a certified weigh scale, a transfer station for separate handling of waste hauled by individuals, a multi-material recycling drop off center and a waste tire shredding operation. Potrero Hills Landfill, Inc. is conducting a composting feasibility study at the site and is examining the practicability of installing a newspaper/corrugated paper baler at the site.

Potrero Hills Landfill is one of the two landfills within the Bay Area equipped with a leachate collection system resulting in the Regional Water Quality Control Board recommending it to handle certain designated waste generated from within the Bay Area.

Future disposal facility operations being explored at the Potrero Hills site include: (1) the installation of small infectious waste incinerator, (2) developing a portion of the property as a Class II facility capable of accepting drilling muds, and (3) establishing a special sewage sludge dewatering and land farming operation to recycle the material into a supplemental supply of dry weather daily cover material.

Solano Garbage Company Landfill

This site is located approximately five miles east of Fairfield, south of State Route 12. With the opening of the Potrero Hills Landfill in 1986, closure activities were begun. No additional waste materials will be accepted at this site. Closure activities are expected to be completed in 1988. Upon closure, the site will probably be converted for use as open space or a recreational facility.

IT Corporation, Montezuma Hills Facility (Denverton) (F)

This facility, referred to previously as the Denverton site, was opened in 1979 and is located at the corner of Collinsville and Little Honker Bay Roads. The site is presently classified by the California Regional Quality Control Board as Class II-1 Limited Hazardous Waste Facility. Currently, 50 acres are in use consisting of nine (9) solar evaporation ponds and three (3) land farming spreading areas. The facility use permit expired in 1987 so that no wastes are currently accepted at the site. The company has submitted a permit application which would remove the existing ponds, install a liner system and convert the site to a Class II non-hazardous solids facility. These changes will place the site under the jurisdiction of the California Waste Management Board.

The permit application indicates that the modernized disposal site would receive "designated wastes". These wastes are defined (CAC Title 23 Subchapter 15) as "(1) non-hazardous waste which consists of or contains pollutants which, under ambient environmental conditions at the waste management unit, could cause degradation of waters of the state", or "(2) hazardous waste which has been granted a variance from hazardous waste management requirements pursuant to Section 66310 of CAC Title 22".

The Department of Health Services has classified designated wastes on a case-by-case basis. A generalized listing of designated

waste categories includes; ash from combustion processes, contaminated soils from underground tank clean-up sites, other chemical industrial processes, refinery wastes, shredder waste, air pollution control facility wastes, asbestos materials, cement kiln dust, gas well brines and drilling muds, sand from sand blasting and casting, saw mill waste, sewage sludge, mine tailings, and treated wood waste.

The permit applicant has also generally proposed disposal of; geothermal waste, paint pigment waste, and contaminated soils from spill clean-up, as well as construction debris, municipal garbage and other "Class III" wastes.

Aqua-Clear Farms, Inc. (Hatch Bros.) (G)

This site is a Class II-1 facility restricted to disposal of drilling muds. It is located on rolling hills at Flannery Road and Rio Dixon Road (SR 113) in the Southeastern portion of Solano County.

The current operation consists of seven (7) ponds, with two (2) safety ponds, utilizing land farming/discing disposal techniques in the summer months and ponding during winter. The site is approved for 110 acres, having been granted a permit to expand the 25 acre operation to an additional 85 acres in 1978. Additional ponds have been constructed on 55 of those acres, with the remainder approved for future use when needed.

Rio Vista Landfill (H)

The Rio Vista site is located on Airport Road north of the town of Rio Vista near the Sacramento River. This 20 acre site, which has been in use since 1950, is owned by the State of California and leased to the City of Rio Vista. The site is operated by a private contractor. The principal source of waste received is from the City of Rio Vista and the nearby unincorporated County area.

The landfill is a trench type of operation, and accepts approximately 100 tons of municipal refuse per week.

Limited recycling is practiced at the site and the salvage is removed at regular intervals. To conserve the remaining capacity of this site for municipal refuse disposal, the operator has terminated the practice of accepting drilling mud from the exploration of gas wells.

Re-evaluation of remaining site life has expanded the life expectancy to 14 years, with closure anticipated at the middle of the Solid Waste Plan long range planning period. Ultimate land use will be open space for an Airport Landing Clear Zone.

B & J Landfill (I)

This disposal site is located south of Hay Road one-half mile west of the Rio-Dixon Road some eight miles southeast of Vacaville. The principal source of waste is from the City of Vacaville, City of Dixon and the Northern Solano County area.

The site is reasonably level, with a total area of about 161 acres. The site disposes about 160 tons of solid waste per day.

Recycling activities are conducted at the B & J Drop Box Landfill. A buyback center is in operation seven days per week.

However, most recycling for the center is conducted during refuse collection with some recycling activities at the active landfill face. Certain types of recyclable materials are processed and stored at the landfill entrance area. These currently include cardboard, aluminum, newspaper, and glass.

The B & J Drop Box Landfill periodically accepts dewatered sewage sludge within the permitted area. The method of handling dewatered sewage utilized at the B & J Drop Box Landfill is co-disposal with refuse fill.

The company is also considering seeking approvals to expand the site to a 320 acre parcel to the east and to establish an infectious waste incineration plant. The proposed expansion would accommodate land farming of sewage treatment plant sludges from within and outside the County.

Both co-disposal in the landfill and land farming of sewage sludge must be approved by the Regional Water Quality Control Board, and the County Environmental Health Services Division as the Local Enforcement Agency. The disposal requirements for dewatered sludge are imposed pursuant to State Policy (CAC Title 14 and Title 23) and are necessary to ensure maintenance of water quality, health and safety. Disposal requirements are determined on a case by case basis depending on the waste characteristics and site engineering. The requirements are designed to prohibit disposal of liquid or hazardous waste sludges, control moisture content, prevent leachate or water contamination, and to establish other operational requirements to maintain public health.

California Medical Facility

This site was located just south of the Medical Facility which is situated southeast of Vacaville. Until 1984, the Facility disposed of about five (5) tons of waste per day at the landfill. Wastes are now trucked to the B & J Drop Box site. Site closure activities have been completed.

III. SOLID WASTE PRODUCTION, COMPOSITION AND PROJECTIONS

A knowledge of the quantity and composition of wastes is fundamental to the planning and design of solid waste collection and disposal facilities. Review of the quantity and composition of solid waste production in the County indicates a number of changes have occurred since preparation of the last Solid Waste Plan update in 1984. Chiefly, changes are reflected in re-evaluation and update of population estimates and other waste projection factors, current waste production and future projections.

Overall, this update of the 1984 plan can be characterized by a general statement that the quantities of all of the waste categories which comprise the County's waste stream will continue to increase over the time span of the plan, but at a rate which is slightly greater than previously anticipated in 1984. At the same time, the composition of the various waste categories is not expected to be significantly affected.

Characteristic Changes Since 1984

The slightly greater waste production estimates can be seen in the updated analysis of municipal wastes which represent the largest proportion (approximately 95%) of all wastes requiring disposal in landfills. Current production estimates of municipal waste are almost 4% greater at the beginning of the long term than the quantities projected in the 1984 plan.

Changes since the 1984 plan have occurred in waste projection factors. Although current census data indicates that the population expanded about as predicted in 1984, there has been an increase in the pounds per capita day waste disposal factors. A recent survey of disposal site operators indicates that the pounds per capita (ppcd.) of wastes disposed is higher than experienced in 1984. When this experience is translated to generation rates, the factor for the total County area is expanded to 5.7 lbs./capita/day, in comparison with the previous figure of 5.0 lbs/capita/day for 1984.

Waste Categories

Four major categories of waste make up the waste stream in Solano County. These are municipal, industrial, agricultural and special solid waste.

Municipal Solid Waste

Municipal wastes are produced as a result of the daily activities of the public and are directly related to the population. As previously noted, these wastes represent approximately 95% of the County's waste stream going to landfill.

Within the category of municipal waste, classification by type and material of typical household waste shows the greatest percentage of wastes to be paper, cardboard, garden trimmings, aluminum cans, glass and plastic. The quantities of each of these constituents of the municipal waste category have increased over the years and appear to be continuing to rise although the trend towards less wet garbage and more of the aforementioned constituents seems to have stabilized somewhat in recent times. In addition to the household wastes mentioned above, the municipal waste category includes self haul wastes and construction and demolition debris.

Overall, the composition of the County's municipal waste appears to be relatively unchanged since the review in the 1984 solid waste plan. The composition analysis of refuse delivered to disposal sites shown in Table III-1 is taken from a report prepared for the California Waste Management Board in 1982. These values for the Bay Area were composed with the 1978 report and composition surveys from other sources. It is anticipated that a continued increase in the percentage of paper, cardboard, and other similar non-wet garbage components will occur to a limited extent. Although it is early to tell, implementation of the California Beverage Container Recycling Act may reduce the Proportions of aluminum and glass. This is likely to result as the County moves towards a more metropolitan character through realization of urban land uses expected in the General Plan.

TABLE III-1 COMPOSITION OF WASTE DELIVERED TO DISPOSAL SITES IN THE BAY AREA

MATERIAL CLASSIFICATION	% BY WEIGHT
Mixed paper	32.5
News print	8.8
Corrugated paper	6.5
Ferrous metal	5.1
Non-ferrous metal	0.9
Plastics	4.0
Garden wastes	13.9
Other organics	16.3
Glass	8.1
Other inorganics	3.9

Source: Waste Generation and Disposal in California 1982, California Refuse Removal Council

Industrial (non process) Solid Waste

Industrial solid waste refers to waste components produced by commercial and industrial establishments exclusive of their process and/or special industrial wastes. These wastes have been incorporated into the municipal waste totals since they are difficult to measure separately. Wastes in this classification consist typically of packaging material, paper and other refuse constituents which do not readily decompose. Volume and composition of these wastes are a function of the type and size of the industry.

Agricultural Solid Waste

Agricultural wastes consist of crop residues (plant remnants and the like) from orchard and field crops and manure production of farm animals. Although agricultural wastes represent the largest quantity of all solid wastes produced; none are disposed in landfills.

Special Solid Waste

Special solid wastes are those wastes requiring special handling or treatment prior to disposal. Special solid wastes include designated wastes, special waste and certain non-hazardous solid waste. Examples of these are infectious wastes, process industrial wastes, cannery wastes, auto bodies, tires, triple rinsed pesticide containers, white goods and water and waste water sludges. Previous plans also dealt with hazardous and chemical wastes which were disposed of at the County's hazardous waste disposal sites. However, with the passage of the hazardous waste planning legislation in 1986, Solano County has chosen to treat all but household hazardous wastes disposed of at landfills separately as part of a comprehensive Hazardous Waste Management Plan. A specific category of wastes which have become of increasing concern in recent years are household hazardous wastes. These are small quantities of hazardous material which are used

around the home including: paints, thinners, cleaners and pesticides. Because of the relatively small individual quantities and the difficulty of separating them from more typical household wastes, these materials usually find their way to the landfill as part of the municipal waste stream. Some hazardous materials are also poured down the drain or onto the ground. Surveys have shown that except for motor oil and occasional cleaning products, households do not generally recycle their hazardous wastes. Household hazardous waste can create problems when it is mixed with solid waste for disposal in municipal waste landfills, or when poured into the sewer or on the ground. These disposal practices can result in exposure of waste collectors and sanitation employees to toxic wastes, and the cumulative effect of disposal over time can result in significant releases to soil and to surface and ground waters. The quantities of typical household hazardous wastes generated in Solano County for 1986 are shown in Table III-2 and projected for year 2000 in Table III-3.

TABLE III-2 HOUSEHOLD HAZARDOUS WASTE GENERATION WITHIN SOLANO COUNTY FOR 1986

Waste Group	Quantity Generated (Tons)	(Percentage)*
Waste Oil	244	35
Halogenated Solvents	4	1
Nonhalogenated Solvents	47	7
Organic Liquids	22	3
Pesticides	19	3
Nonhalogenated Organic Sludges/Solids	28	4
Dye and Paint Sludges/Resins	174	25
Nonmetallic Inorganic Liquids	61	9
Other Inorganic Solid Wastes	107	15
TOTAL	**704**	

*Percentages do not add up to 100% due to rounding

TABLE III-3 ESTIMATED HOUSEHOLD HAZARDOUS WASTE GENERATION WITHIN SOLANO COUNTY FOR 2000

Waste Group	Quantity Generated (Tons)	(Percentage)*
Waste Oil	409	35
Nonhalogenated Solvents	78	7
Halogenated Solvents	8	1
Organic Liquids	36	3
Pesticides	32	3
Nonhalogenated Organic Sludges/Solids	46	4
Dye and Paint Sludges/Resins	292	25
Nonmetallic Inorganic Liquids	102	9
Other Inorganic Solid Wastes	179	15
TOTAL	**1,182**	

*Percentages do not add up to 100% due to rounding.

The total household hazardous waste generated in 1986 (704 tons) represents about .24% of the County's total annual waste disposed (288,900 tons). The largest portion of household waste as shown in Table III-3 is waste oil (about 35%). The City of Vallejo has initiated a twice yearly household hazardous waste collection program with Vallejo Garbage Service. The Cities of Vacaville, Benicia and Dixon are also proposing to initiate household hazardous waste collection programs. Waste oil is currently recycled at three locations in Vallejo and at the American Canyon Landfill. The City of Fairfield has two locations for recycling waste oil including a site operated by Solano Garbage Company. Rio Vista also has two waste oil recycling locations. The Cities of Benicia and Dixon each have one, and Vacaville has three waste oil recycling locations.

The County Hazardous Waste Plan identifies the key objectives for a County wide household hazardous waste program. The County program would be undertaken in three phases, and includes consideration of collection options for household hazardous wastes at a single site or at a number of decentralized locations as well as mobile collection service. Public education and awareness programs and collection program monitoring have also been recommended in the Plan.

The specific categories contributing the most significant amounts of special solid wastes entering Solano County's waste stream are natural gas well drilling mud wastes, food processing and cannery wastes and water and waste water treatment sludge. Of these, only drilling muds contribute an appreciable amount of special solid waste disposed in the County's landfills. Drilling muds which are currently disposed at a special disposal site represent about 20% of the total solid waste volume being landfilled. Other special solid wastes produced in the County in significant quantities such as waste water treatment sludge are presently disposed of by land application/land spreading, and on site storage, in addition to land filling. The County is expected to continue to have adequate capacity for disposal of wastewater treatment sludge which is either dewatered prior to landfill or land farmed. Although not directly affecting Solano County, special solid wastes with a high moisture content are, however, becoming an increasing disposal problem for solid waste sites throughout the region because they must be disposed of at sites with leachate control systems. Two landfills, the Potrero Hills landfill in Solano County and the Kirby Canyon landfill in Santa Clara have systems capable of accepting these waste. Potential landfill of these wastes at the Potrero Hills site will require County and State approval and conformance with County policy for importation of wastes. The Potrero Hills site has currently been granted approval for limited volumes of high moisture content waste on a case by case basis. The largest quantity of high moisture wastes produced in the County, drilling mud, presently goes to the Aqua Clear Farms site. This will continue until the

site reaches capacity or closes (potentially before 1989), after which these wastes will go to a replacement site either in or out of the County.

Wastes such as auto bodies, waste oil, white goods (large appliances, refrigerators, etc.), and tires do not usually enter the mixed municipal waste stream and require special handling. However, these represent a relatively small proportion of the total special waste load. They do not contribute significantly to the quantities of waste disposed in landfills in the County. Many of these wastes are recycled, or have recycling potential.

Other special solid wastes including infectious wastes contribute only an insignificant portion of the total amount of special wastes landfilled and are not expected to increase greatly in future years.

Waste Projection Factors

Solid waste production for an area is directly related to the type of development within that area. Accordingly, a determination of existing and future land development population is basic to any solid waste study. Ultimate populations and land development patterns used for a study such as this should be based on realistic estimates. If too low estimates are used, undersized facilities, that are costly to duplicate, may result.

In conjunction with the determination of existing solid waste production and the projection of future solid waste loadings, it is important to identify the waste production potential by sub areas within the county. For planning purposes, the County is divided into five major sub-areas which conform to the six planning areas included in the Solano County General Plan. These sub-areas are identified in Figure III-1, the major existing solid waste disposal sites in each planning area are identified by letter designation which matches Figure II-1. The general areas served by them, and the flow of refuse are also shown in Figure III-1.

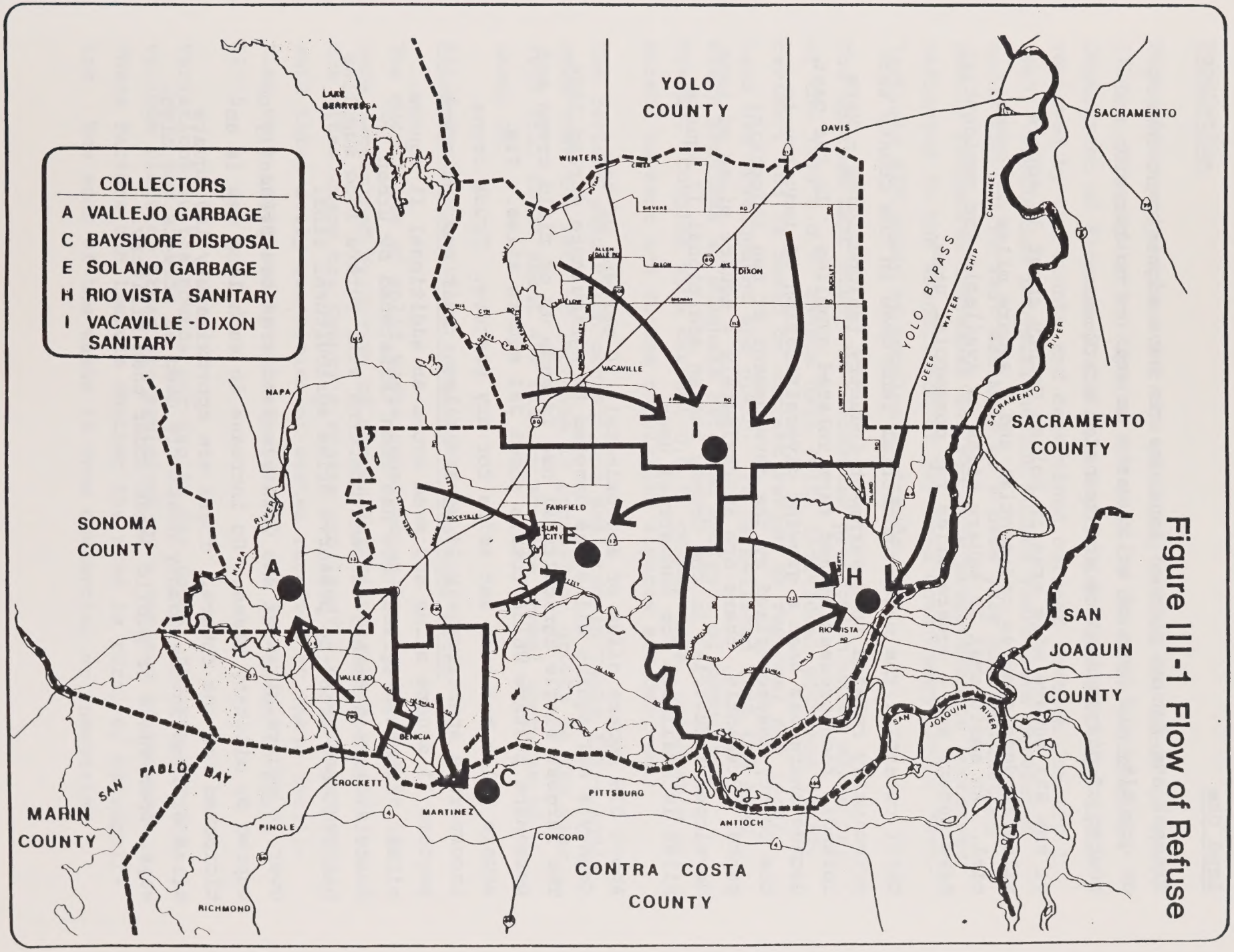

Figure III-1 Flow of Refuse

Land Use

Present and future planned land use can have significant impact on quantity and type of solid waste as well as on location and number of disposal sites and transfer stations.

Of the 827 square mile area in Solano County about 15 square miles is developed as residential and 3 square miles is commercial. An additional 30 square miles is available for residential development and 4 square miles for commercial uses.

Until recently, the major industrial land uses in the County were principally related to government-industry (shipbuilding - Mare Island), food processing and farm related supplies. In the past decade there has been a growing diversification of industry in the County characterized by the development of ten industrial parks. Presently, there are approximately 4 square miles of land developed industrial in the County and an additional 17 square miles is available for industrial uses.

About 575 square miles or approximately 70 percent of the County's 827 square miles was devoted to agriculture during 1986. The largest single agricultural use is made up of field crops and permanent pasture which totals about 283 square miles. 226 square miles has been set aside for dry pasture. Truck crops incorporate approximately 34 square miles, fruit and nut crops another 21 square miles and seed crops an additional 11 square miles. Although agriculture has been threatened by urban industrial encroachment, current concerns with future food supplies has led to a trend to preserve prime agricultural land.

Over 14 square miles of the County's land area are presently occupied by military bases. No increase in such land use is anticipated for the future. There are approximately 165 square miles of land in the County presently used as streets and highways, open space or public lands other than military.

Population

Population projections for the planning period are shown in Table III-4. The population update for 1987 is based on California Department of Finance (D.O.F.). Population Research Unit data, reviewed by the County and determined current through January 1, 1987. Population projections for future years were developed using the D.O.F. 1987 estimate as a base year and calculating yearly projected increases derived from proportionate increases reflected in the Association of Bay Area Government (ABAG) "Projections 87" study of population trends.

The updated ABAG study is a computer projection which makes use of the 1980 D.O.F. census data (with individual city and county review), and is based on current review of regional and local land use development and plans. It is believed that the ABAG study provides an adequate detailed analysis of population trends. Coupled with current D.O.F. census data, reasonable accurate current and future population figures are derived.

The revised population projections depicted in Table III-4 indicate that the rate of increase in population growth to the year 2005 will total about 49% with an average annual increase of about 3%.

Solid Waste quantities received at disposal sites

The quantities of solid waste received at disposal sites in 1987 were determined by survey of disposal site operators at each of the sites where the County's wastes are landfilled. The approximate total daily quantities of wastes received at these facilities were estimated by site operators, and are shown in Table III-5.

Variations in the pounds per capita day (ppcd) figures for the various planning areas are explained by a variety of factors. These factors can include whether the area is rural or metropolitan. How much of the waste is from commercial or industrial

sources and the accuracy of how the waste is measured. The high per capita figure for Fairfield-Suisun may be partially explained by the fact that the Potrero Hills site has installed a scale and now weighs each vehicle which enters the site. Other sites estimate wastes from the vehicles which enter and adjust their estimates from periodic surveys of waste volume in place. Eight percent of the wastes accepted at Potrero Hills is waste water sludges, a high proportion when compared with other sites. Also, Fairfield-Suisun wastes are probably higher because there is more commercial activity through the Solano Mall. Neither Vallejo or Vacaville currently have such a large commercial facility.

TABLE III-4 PRESENT AND PROJECTED POPULATION FOR SOLANO COUNTY

Planning Area	Population			
	1987[a]	1992[b]	1997[b]	2005[b]
Vallejo	94,872	107,060	114,940	119,400
Benicia	22,352	26,480	28,180	28,600
Fairfield-Suisun	90,844	110,054	128,914	155,020
Vacaville	65,481	73,254	85,076	104,397
Dixon	13,171	14,376	15,638	17,802
Rio Vista	4,544	5,676	7,392	10,281
TOTAL COUNTY	291,264	336,900	380,140	435,500

[a]D.O.F. Estimate 1-1-87 (from 1980 census)

[b]Incremental growth based on ABAG Projections 1987 (updated by ABAG 7-87

TABLE III-5

SOLID WASTES RECEIVED AT EXISTING DISPOSAL SITES SERVING SOLANO COUNTY

Code	Disposal Site Name	Planning Area	Daily Waste tons/day[a]		Annual Waste 1,000 tons	
			Disposal Site	Planning Area	Disposal Site	Planning Area
A	American Canyon	Vallejo	200		60.2	
B	Mare Island		42.0[b]		15.3	
D	Redwood Landfill	Mare Island Residential	10.4		3.8	
	Subtotal			252.4	79.3	79.3
C	Acme	Benicia	46.0	46.0	16.8	16.8
E	Potrero[c] Hills Landfill	Fairfield-Suisun	294.4		107.5	107.5
D	Redwood	Travis AFB	23.7		8.6	
	Subtotal			318.1		116.1
I	B & J Dropbox	Vacaville	133.0	133.0	48.5	48.5
I	B & J Dropbox	Dixon	27.0	27.0	9.9	9.9
H	Rio Vista	Rio Vista	15.0	15.0	5.5	5.5
	Total			791.5		276.1

[a]Seven days per week

[b]Industrial only

[c]Includes 9% sludges

The table relates daily quantities of waste to population and planning areas. Based on a total 1987 population of 291,294 and a total municipal waste load of 791 tons per day received at disposal sites Countywide; the per capita production rate is approximately 5.4 pounds per capita per day. This figure includes residential, commercial, industrial nonprocess, demolition, street sweeping, litter wastes and some water and waste water sludges. Excluded are agricultural, cannery and other special wastes.

Waste Projections:

Municipal wastes

A ppcd factor for municipal waste anticipated to be generated County-wide was determined by calculating a weighted average from the the California average per capita refuse production for Metropolitan and rural population areas. These values, provided by the California Waste Management Board, are about 5.2 ppcd for metropolitan areas, and 3.7 ppcd for rural areas. With the assumption that Solano County is composed of both a metropolitan and rural population, the weighted average is approximately 4.7 ppcd . An additional 1.0 ppcd can be added to account for City street refuse, County road litter, and demolition construction debris, for a total solid waste production factor of 5.7 ppcd.

Although there is a difference between the pounds per capita day for wastes generated (5.7 ppcd) and the ppcd for wastes received at the sites (5.4 ppcd), it is considered that the 5.7 ppcd figure is a more appropriate estimate of per capita production on which to base projection of anticipated municipal solid wastes. One reason for this is that disposal site operator estimates of daily waste at sites which do not weigh are considered fairly conservative. Those estimates largely reflect only what was collected by the franchised collector, and are not likely to fully account for a significant amount of waste brought to the site by the cities and other government entities or in private vehicles. Additionally, wastes generated but not accounted for at disposal

sites can partially be attributed to illegal dumping at unauthorized sites, and along roadways, etc.

Further, it appears judicious to use the 5.7 ppcd factor for municipal solid waste production rather than the 5.4 ppcd figure, for purposes of solid waste planning. Using the larger figure assures that facilities to accommodate waste loads are planned realistically. If waste load estimates are too low, problems such as unanticipated early closure of existing facilities and crises management of the waste stream, as well as planned construction of undersized facilities that are costly to duplicate, and similar detrimental planning policies can occur. The pounds per capita day waste production factors are 5.7-1987, 5.95-1992, 6.2-1997 and 6.6-2005. Projected increases in the pounds per capita per day waste production factors (at .5 ppcd per decade) assumes an average annual increase in per capita production to the year 2005 of about 1% per year. Prior to 1970, the rate of per capita increase of solid waste production was approximately 2% per year. However, a reduction in the annual rate of increase has become apparent in recent years as greater awarness of the effects of our affuence has resulted in measures to reduce the rate of increase of wastes produced. The revised projections of municipal solid waste are given on Table III-6.

Agricultural Waste Projection

Updated projection factors for agricultural wastes (crop residues) were derived from review of the County's agricultural output inventoried in the 1986 Agricultural Crop Report and utilizing waste generation factors developed by the University of California Division of Agricultural Services and the California Waste Management Board. Residue figures were calculated by multiplying acreage figures, production tonnages and animal population by the appropriate factors. Average residue tonnages were grouped by major crop type into vegetable crops, field crops, and fruit and nut crops. Factors utilized assume bone dry weight for vegetable crops, air dry weight (approximately 14% moisture content) for field crops, and field weight (25 to 40%

TABLE III-6. PROJECTED QUANTITIES OF MUNICIPAL SOLID WASTE BY PLANNING AREAS, 1000 TONS PER YEAR

Planning Area	Waste Tonnage by Population			
	1987	1992	1997	2005
Vallejo	98.7	116.3	130.0	143.8
Benicia	23.3	28.8	31.9	34.5
Fairfield-Suisun	94.5	119.5	145.9	186.7
Vacaville	68.1	79.5	96.3	125.7
Dixon	13.7	15.6	17.7	21.4
Rio Vista	4.7	6.2	8.4	12.4
Solano County	303.0	365.9	430.2	524.5

odhtab4

moisture content) for fruit and nut crop prunings. Only bearing acreages and those crop residues that can most easily be picked up and handled were included.

Crop residue projection factors are based on production averages. Because local crop patterns, acreages and production change from year to year due to market, seasonal and other considerations, residue production increases from 1971 to 1981 were analyzed to determine average annual production increases. It was assumed that no significant increase in residue production would occur over the short term 1987 to 1992 due to these variations in crop type and production. Average annual increases were cumulatively applied to the medium and long term planning periods 1993 and 2005 to account for percentage increases in crop residues, assuming that increases would be proportionate to the increases found between 1971 and 1981. These values were adjusted to account for changes in land use based on recent development trends and General Plan Policies. For example, it was assumed that orchard pruning residues would decline in later years with a decline in orchard land acreages converting (per Plan policy and changing agricultural practices) to residential and other agricultural uses in the Wolfskill and Suisun Valley areas of the County. Revised agricultural waste projection are shown on Table III-7.

Special Solid Waste Projection

Projection factors for special solid wastes were updated by current review of industry production conditions, population factors, changes in technology and survey of producers. Projections of special solid wastes by planning area are shown in Table III-8.

Water and Waste Water Sludges. Projections of sewage sludge generation are based on a survey of waste water treatment plants in each of the County's incorporated cities. Generally this survey (besides providing current sludge production estimates) indicates that with the exception of Vallejo sludge quantities have increased since 1984. With the exception of the City of Vallejo,

TABLE III-7. SOLANO COUNTY AGRICULTURAL SOLID WASTE PRODUCTION 1,000 TONS PER YEAR

Type Waste	1987[a]	1992[a]	1997[a]	2005[a]
Fruit and Nut Crops	19.6	18.6	17.7	14.9
Field Crops	374.8	374.8	356.1	327.6
Vegetables	29.0	29.0	27.5	25.3
Subtotal	423.4	422.4	401.3	367.8
Livestock Manure	10.4	10.7	11.2	9.2
Total	433.8	433.1	412.5	377.0

[a] Estimate based on 1986 County Agricultural Report, Crop Residues in California, UC Agricultural Extension and Economic Practices
Manual, Governor's Office of Planning and Research

TABLE III-8 SOLANO COUNTY SPECIAL INDUSTRIAL WASTES PRODUCTION
1000 TONS PER YEAR

Year	Planning Area	Sewage Sludge Generated	Sewage Sludge Disposed[a]	Food Processing Waste Generated	Food Processing Waste Disposed	Drilling Mud Generated	Drilling Mud Disposed	Total[h] Special Waste Disposed
1987	Vallejo	22.0[d]	0					0
	Benicia	.63	.63[e]					.63
	Fairfield-Suisun	7.0	7.0	106.7[c]	2.7[f]			9.7
	Vacaville	4.1	4.1	0	0			4.1
	Dixon	0	0	8.5[b]	0			0
	Rio Vista	.03	.03					.03
	Total County	33.8	11.8	112.6	2.7	167.7[g]	417.7[g]	14.5
1992	Vallejo	26.3[d]	0					.0
	Benicia	.76	.76[e]					.76
	Fairfield-Suisun	8.2	8.2	106.7[c]	2.7[f]			10.9
	Vacaville	4.7	4.7	0	0			4.7
	Dixon	0	0	6.2	0			0
	Rio Vista	.035	.035	0				.035
	Total County	40.0	13.7	112.7	2.7	167.7[g]	0	16.4
1997	Vallejo	30.6	0					0
	Benicia	.9	.9[e]					.9
	Fairfield-Suisun	9.3	9.3	106.7[c]	2.7[f]			12
	Vacaville	5.4	5.4	0	0			5.4
	Dixon	0	0	6.2				0
	Rio Vista	.04	.04	0				.04
	Total Country	46.3	15.7	112.7	2.7	167.7[g]	0	18.4
2005	Vallejo	35.0	0					0
	Benicia	1.0	1.0[e]					1.0
	Fairfield-Suisun	10.0	10.0	106.7[c]	2.7[f]			12.7
	Vacaville	6.3	6.3	0	0			6.3
	Dixon	0	0	6.5	0			0
	Rio Vista	.05	.05	0				.05
	Total County	52.4	17.4	113.2	2.7	167.7[g]	0	20.1

[a]Disposal in Sanitary landfill

[b]Tomato waste on agricultural land and 2695 tons

[c]104,000 tons Brewer's Grain to besold as fodder

[d]Sludge not disposed used as soil conditioner

[e]Disposal at West Contra Costa landfill

[f]Diatonaceous earth disposed in lanfill

[g]1000 barrels

[h]Excludes drilling muds

all of the cities are currently disposing of sludge in landfills. The City of Vallejo does not landfill sludge, but rather, disposes of it in a land application agricultural project on Tubbs Island in Sonoma County. This is planned to continue in future years. Although land application of sludge is a promising alternative to landfill disposal for all of the cities, variation in waste constituents (potential industrial contaminants, heavy metals, etc.), necessitates that each district evaluate land application projects on a case by case basis to determine feasibility.

Water treatment plant sludges comprise a very small part of the total. Fairfield generates about 564 tons of water treatment sludges per year which go to Potrero Hills Landfill. Vacaville generates 861 tons per year, and Benicia generates 4.5 tons per year. Quantities were unavailable from other cities.

Sludge production is expected to continue to increase in future years proportionately to the growth of the cities. It is assumed that population projections represent an appropriate factor to project sludge generation. Current methods of disposal will continue for the life of the plan.

Food Processing and Cannery Waste Projection Factors. Projection of food processing wastes rely on surveys of the canning industry in the County. Projection factors are based on production conditions and planned expansion. Wastes from these sources are currently disposed by land application and are not landfilled. It is assumed that this process will continue, and no landfilling of these wastes will occur through the term of the Plan.

Drilling Mud Waste Projection. Table III-8 shows the estimated current production of drilling mud wastes disposed in Solano County. The table reflects an amount (167 thousand barrels) estimated to have been generated and disposed in the County, as well as an additional amount (250 thousand barrels) estimated to be disposed in County that originate at out of County well fields.

In reference to future projections of drilling wastes, the table shows no change in wastes generated through the term of the plan. This reflects the difficulty in determining reliable factors to project drilling mud wastes. Therefore, the production of mud waste requiring disposal in Solano County landfills will be held at 1987 levels through the short term (1992) long term periods. Disposal capacity only exists for the short term planning period. Aqua Clear Farms disposal site is expected to reach capacity or close during this period (Potentially 1989); after which drilling mud wastes will go to a replacement site either in or out of the County.

Infectious and Asbestos Waste. Two wastes which are not included in Table III-8 are asbestos and infectious wastes. According to Department of Health Services estimates, the County generated 451.6 tons of asbestos containing waste in 1986 and disposed of 273.8 tons of such waste. It is not clear from these statistics what proportion of the waste generated in County was also disposed here, nor is it clear what proportion of the asbestos containing waste disposed here came from out of County. The largest generators were the Exxon Refinery in Benicia and Mare Island Naval Shipyard in Vallejo. Most of these wastes are one time disposal activities which will diminish as facility retrofit is completed. Asbestos containing wastes are received at Mare Island, Potrero Hills and B & J Drop Box. It is expected that these facilities will be able to continue to accept such wastes in the future.

Infectious wastes are currently accepted at B & J Drop Box. The quantities have ranged from a high 1770 lbs. a month in October of 1986 to 150 lbs. a month in more recent times. The high figure occurred when the California Medical facility disposed of its infectious waste at the site; however, CMF wastes are now exported out of County and incinerated. It is estimated that one ton of infectious waste will be disposed at B & J in 1987.

Other Special Solid Wastes. It is equally difficult to predict the quantities of other special wastes which are not normally or

presently a part of the disposal process. These can include incinerator ash, various kinds of sludges, grease trap pumpings and wastes with a high moisture content such as spoiled alcohol. These wastes may not be deemed hazardous but require special handling. A number require leachate systems. This requirement is likely to put increasing pressure on the Potrero Hills Landfill which is one of only two sites in the Bay Area with such a system.

Land Requirements

The estimated maximum land requirements to accommodate the solid waste anticipated to be disposed of through the term of the plan have been calculated utilizing the solid waste projections from Table III-9. Land requirements for sanitary landfill over any period of time depend on disposal methodology and site management as well as quantities received. Land requirements for the years 1988-1992, 1993-1997, 1998-2005 are shown in cubic yards on Table III-10. The required volume includes an allowance for earth cover equal to one part earth per four parts solid waste by volume compacted to 3,000 lbs. per cubic yard. The table reflects a compaction rate of 1200 pounds per cubic yard for the solid waste. The values on the table show land requirements in cubic yards. Cumulative projections of land requirements in cubic yards are shown for each of the planning periods on Table III-11, as well as the remaining capacity at existing landfills reported by operators in Table II-1. The table indicates that sufficient capacity remains to dispose of County wastes throughout the long-term planning period.

TABLE III-9 SUMMARY OF SOLID WASTE PROJECTIONS
1,000 TONS PER YEAR

Year	Planning Area	Total[a] Refuse	Special[b] Solid Waste	Agricultural[b] Waste	Total Solid Waste
1987	Vallejo	98.7	.5		99.2
	Benicia	23.3	.6		23.9
	Fairfield/ Suisun	94.5	10.3		104.8
	Vacaville	68.1	4.6		72.7
	Dixon	13.7	0		13.7
	Rio Vista	4.7	.03		4.7
	Total County	303.0	16.0	0	319.0
1992	Vallejo	116.3	.6		116.9
	Benicia	28.8	.8		29.6
	Fairfield/ Suisun	119.5	11.5		131.0
	Vacaville	79.5	5.3		84.8
	Dixon	15.6	0		15.6
	Rio Vista	6.2	.03		6.2
	Total County	365.9	18.2	0	384.1
1997	Vallejo	130.0	.8		130.8
	Benicia	31.9	.9		32.8
	Fairfield/ Suisun	145.9	12.7		158.6
	Vacaville	96.3	6.1		102.4
	Dixon	17.7	0		17.7
	Rio Vista	8.4	.04		8.4
	Total County	430.2	20.5	0	450.7
2005	Vallejo	143.8	1.0		144.8
	Benicia	34.5	1.1		35.6
	Fairfield/ Suisun	186.7	13.7		200.4
	Vacaville	125.7	7.3		133.0
	Dixon	21.4	0		21.4
	Rio Vista	12.4	.05		12.4
	Total County	524.5	23.1	0	547.6

[a] Total solid waste collected by refuse collector to either transfer station or sanitary landfill

[b] Solid Waste collected by private hauler direct to sanitary landfill

TABLE III-10 LANDFILL VOLUME REQUIREMENTS BY PLANNING AREA IN 1,000's OF CUBIC YARDS

Planning Area	1987-1991	1992-1996	1997-2005
Vallejo	974.2	1,122.6	2,273.7
Benicia	240.0	283.1	564.3
Fairfield-Suisun	1,056.7	1,302.0	2,961.8
Vacaville	710.8	841.9	1,942.0
Dixon	132.6	150.7	322.6
Rio Vista	48.6	64.9	171.6
Solano County	3,162.9	3,765.1	8,236.0

TABLE III-11 SOLANO COUNTY SANITARY LANDFILL VOLUME REQUIREMENTS[a] IN 1,000's OF CUBIC YARDS

Planning Area	1987-1991	1987-1996	1987-2005	Currently Available in County
Vallejo	974.2	2,096.8	4,370.5	364.5[b]
Benicia	240.0	523.0	1,087.3	0[c]
Fairfield-Suisun	1,056.7	2,358.8	5,320.5	16,936.5[d]
Vacaville	710.8	1,552.6	3,494.7	9,642.5
Dixon	132.6	283.3	605.8	0[e]
Rio Vista	48.6	113.5	285.1	285.1
Solano County	3,162.9	6,928.0	15,163.9	27,229.0

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[a]Includes only wastes disposed at solid waste landfill
[b]Does not include American Canyon or Redwood
[c]Does not include Acme Fill
[d]Does not include Redwood or Yolo County
[e]Disposed at B and J Dropbox

IV. RESOURCE RECOVERY ELEMENT

The California Waste Management Board has established several planning goals that emphasize reductions in waste generation, recycling of reusable materials, processing and burning of refuse for energy, and provision for safe and efficient disposal of the remaining refuse. The Resource Recovery Element supports these goals with planning policies and specific implementation strategies. These policies and strategies strive to:

1. reduce waste disposal volumes at existing landfills thereby increasing the lifetime of disposal sites,

2. reduce County litter problems,

3. reduce potential environmental problems, and

4. encourage energy conservation and the development of waste to energy projects.

The Resource Recovery Element is an update of the resource recovery information contained in the 1983 Solid Waste Management Plan. It is divided into three sections. Part I, RESOURCE RECOVERY POLICIES AND PROGRAMS, contains the goals, objectives, planning policies, programs for resource recovery, and an implementation schedule. Part II, RESOURCE RECOVERY BACKGROUND, provides a summary of pertinent resource recovery techniques and processes updating the data contained in the 1984 Plan. Part III, RESOURCE RECOVERY ALTERNATIVES, is the analysis of alternative resource recovery processes and techniques that could be applied in Solano County. It also serves as the foundation for the resource recovery policies and programs found in Part I.

PART I. RESOURCE RECOVERY POLICIES AND PROGRAMS

Recognizing the need to conserve natural resources and to save energy, this element incorporates goals, objectives, policies and programs that promote resource recovery and overcome constraints on resource recovery.

Goals

1. Adequate recycling and material/energy recovery facilities and services that are sanitary,safe, and environmentally sound, and meet the County's residential, institutional, commercial, industrial, and agricultural needs.

2. Waste reduction to conserve energy, natural resources, and land resources.

3. Recovery and recycling of 20% of the County's total solid wastes to conserve energy, land, and other natural resources.

4. Adequate litter control.

Objectives, Policies, Implementation Strategies

To reach these four goals, objectives have been developed. These objectives are supported by a series of policies and implementation strategies.

Objective 1: Promote recycling programs

Policy 1: Support efforts to expand recycling of aluminum, and other metals, plastics, glass, all types of paper, agricultural and industrial by-products, used oil, and any other by-products.

a. Strategy: Reestablish Solano County's white office paper recycling program and encourage the establishment of white paper programs in cities.

b. Strategy: Support the implementation of AB 2020 programs, the new recycling law.

c. Strategy: Monitor the development and operation of the certified recycling facilities resulting from the implementation of AB 2020.

d. Strategy: Encourage the continuation of the various existing recycling programs and monitor the impact of AB 2020 on them.

e. Strategy: Maintain and/or expand the number of recycling containers at disposal sites and other appropriate locations in the County.

f. Strategy: Reassess the potential for increased recycling by preparing a feasibility study for the implementation of a multi-material curbside recycling program in each city.

g. Strategy: Encourage increased recycling in private businesses and institutions, such as cardboard routes and office paper separation.

h. Strategy: Promote the establishment of additional permanent used oil handling facilities.

i. Strategy: Continue the activities of the Resource Recovery Advisory Committee.

Policy 2: Monitor recycling of solid wastes generated in Solano County

a. Strategy: Conduct survey to collect baseline data for the volume of materials removed from wastes stream by recycling or reprocessing.

b. Strategy: Update this information on a biannual basis

c. Strategy: Conduct a waste composition study to provide information on which to base program proposals and determine the results of program implementation.

Policy 3: Develop markets for recyclable materials

a. Strategy: Encourage industry and government to purchase and use recycled materials, and consumers to buy recycled products and/or products manufactured from recycled materials.

b. Strategy: Government offices shall institute procurement procedures that provide a preference for the purchase of recycled products and/or products manufactured from recycled materials.

c. Strategy: Continuation of the Resource Recovery Advisory Committee's public information program promoting recycling and the use of recycled products.

d. Strategy: Encourage the development of recycling industries in Solano County such as newsprint de-inking and plastics recycling.

e. Strategy: Support the passage of state legislation that provides tax credits for the use of recycled material.

Objective 2: Promote waste reduction of municipal solid wastes

Policy 1: Encourage composting

a. Strategy: Conduct feasibility studies of composting of organic vegetative wastes (leaves,

tree prunings, lawn clippings) for use in municipalities and on landfills.

Policy 2: Inform the public about waste reduction

a. Strategy: Maintain a public information program that promotes waste reduction.

Policy 3: Support state and federal policies that encourage product durability, use of recycled materials in manufacture, elimination of excess packaging, and banning of nonbiodegradable materials.

a. Strategy: Resource Recovery Advisory Committee will participate as a facilitator in this program.

Objective 3: Support litter cleanup, enforcement, and education programs

Policy 1: Support an abandoned vehicle abatement program

a. Strategy: Monitor the abandoned vehicle situation by contacting the cities and County law enforcement departments and report on status in annual report.

b. Strategy: Track new state legislation and other counties' programs to learn abut programs that could be implemented in Solano County.

Policy 2: Expand litter control programs, and education in Solano County

a. Strategy: Continue to support the County's litter control programs, such as the Inmate Litter Control Program and Operation Brightside of the Solano County Economic Opportunity Council (SCEOC).

b. Strategy: Provide assistance to city and non-profit organization litter programs, if needed.

Policy 3: Seek other sources of program funding

a. Strategy: Identify sources of funding from AB 2020 and encourage and assist local conservation groups and public and private agencies in obtaining grants.

Objective 4: Promote the development of materials recovery and waste to energy projects

Policy 1: Expand knowledge of resource recovery

a. Strategy: Monitor waste to energy and materials recovery projects being implemented in other communities.

Policy 2: Implement resource recovery projects as feasible

a. Strategy: Support solid waste materials and energy recovery projects that are environmentally compatible and cost effective.

b. Strategy: Encourage the design of projects that integrate recycling, composting and energy recovery.

Existing Resource Recovery and Litter Control Programs

Resource Recovery Advisory Committee

One of the most significant steps that can be taken to promote resource recovery is the continuation of the activities of the Resource Recovery Advisory Committee. The Committee, supported by County staff, is charged with implementing many of the strategies outlined in the previous section.

Committee tasks include promoting and coordinating recycling programs by evaluating various recycling proposals and developing implementation plans; removing constraints to recycling by establishing informational programs; and promoting markets for recyclables. The committee is also charged with monitoring technological advances and progress in developing and implementing materials recovery and waste to energy projects. One specific task is to update the Resource Recovery Element of the County Solid Waste Management Plans. To update this plan and to meet recycling goals set by state legislation, the committee needs to establish baseline data on recycling in the County and maintain it on a biannual basis.

Membership is diverse and includes those people most interested in or involved with some aspect of resource recovery. Representatives are from the collectors, service groups, cities, County, and other interested parties. Membership can change yearly; current members represent the following interests:

1. Waste Collection Industry

   Vallejo Garbage Service
   Solano Garbage Company
   Bayshore Disposal
   Vacaville Sanitary Service

2. Waste Producing Industry

   Solano Beer Wholesalers Association
   Napa-Solano Bottlers Association

3. Recycling Industry

   Vallejo Community Organization Recycling (VALCORE)
   Atlas Metal and Iron Corporation
   Vacaville Recycling Center
   M & M Paper Recycling

4. Cities

Vallejo/Benicia
Fairfield/Suisun City
Vacaville/Dixon

5. Public Interest

Supervisorial District 1
Supervisorial District 2
Supervisorial District 3
Supervisorial District 4
Supervisorial District 5
League of Women Voters
Sierra Club
Solano Taxpayers Association

AB 2020 - The Recycling Law

With the implementation of the California Beverage Containers Recycling and Litter Reduction Act known as the Recycling Act (AB 2020) the entire recycling business is changing. This new law is administered by the Division of Recycling within the Department of Conservation and has the goals of increasing recycling efforts and decreasing litter. The law is based on the idea of mandated convenience zones with recycling facilities in each zone. A convenience zone is defined as a one half mile radius around any supermarket conducting $2 million or more in business annually. Within these convenience zones, a recycling facility must be established that will take back and pay consumers for the four redeemable beverage container types: aluminum, glass, plastic and non-aluminum metal. At the request of a local government, the Department may grant exemptions to the convenience zone requirements to benefit existing nonprofit centers and/or curbside recycling programs. There can be more than one certified recycling center in a convenience zone, and certified centers can locate outside of convenience zones.

Starting September 1, 1987, beverage distributors pay a penny per container into a special state fund. Beginning October 1, 1987, consumers, who recycle, receive the penny redemption value plus applicable bonuses. Dealers who do not have a recycling or redemption facility located within their convenience zone on or after January 1, 1988 must either redeem all four beverage container types or pay a fine of $100 per day. By January 1, 1990, if the recycling rate does not reach 65 percent, the redemption value will be increased to two cents. If by January 1, 1993, the rate is not 65%, the redemption value would increase to three cents.

At a penny level, it is estimated that the measure will create $100 million annually. Funds remaining in the account because of unredeemed containers will go toward incentive payments; establishing redemption centers in unserved areas; fund litter abatement programs through community conservation corps; bonuses to the consumer; recycling information, education and promotion; and administration.

Finally, the new recycling law provides for payment to certified, drop-off and curbside programs for each beverage container they recycle, the redemption value, the applicable redemption bonus, and one percent of the redemption value for administrative costs. These funds will help by offsetting costs and thereby increasing their profit margins. The Resource Recovery Advisory Committee will maintain a list of all certified recycling or redemption facilities in the county that buy the four beverage containers.

Existing Recycling Centers

Looking at the County's existing facilities, their primary function has been the recovery of residential waste: newspapers, aluminum cans, glass, tin cans. The recycling facilities may be dropoff centers managed by local collectors, nonprofit community groups, local businesses, or individuals. These facilities usually provide containers for paper, glass, and/or metal placed

at central locations convenient to both the waste generator (individuals) and the collector. City or private corporation yards, school yards, or parking lots are used for these sites. There are also several mobile programs in the County where the collector comes to the waste generator to collect wastes.

It is not known what effect the new recycling law will have on existing facilities and programs. The bill was written to increase recycling in the State, and does make provisions to assist certified nonprofit facilities and curbside programs. The Resource Recovery Advisory Committee will work with existing facilities to help provide information and assist with the certification process during the implementation period. The Resource Recovery Advisory Committee will continue to maintain listings of centers that are not able to become certified and will continue as non-profit donation facilities. Right now there are two: VALCORE Recycling Center in Vallejo and Vacaville Recycling Center.

It is difficult to predict the effect the implementation of the new recycling law will have both on existing certified and uncertified facilities and ultimately on the reduction of the waste stream going to landfills. It is estimated that the beverage containers affected by this law represent only 5% of residential-solid wastes. Residential wastes constitute about half of the waste landfilled. The state goal for recycling of these containers is 65%. At that rate of recycling, the waste stream will be reduced approximately 1.5%. However, if curbside collection programs are initiated, it is anticipated that a significant portion of these containers will be included in the curbside collection. Therefore, a separate impact for AB 2020 will not be estimated, since it will be divided between the estimated increases for recycling centers and the potential waste disposal reduction projected as a result of curbside programs.

Curbside Collection

A study will be undertaken to determine the feasibility of implementing multi-material curbside recycling programs. This study would include the financial analysis of curbside recycling in Solano County cities and an analysis of the feasibility of integrating curbside recycling with existing municipal garbage service in the cities.

In the short term, pilot programs could be started in Fairfield and Vacaville, since these cities would have the volume of wastes and the population density to support a curbside program. However, the implementation of such a program would depend on the existing collection services. Currently only Vallejo has started a program that has the potential for becoming a curbside collection program.

Vallejo started a mobile buyback program in 1986 that purchases cardboard, glass, newspaper and aluminum. It consists of one truck moved to regular locations along an established route. The recyclables from this truck are combined with those accumulated from eight certified redemption centers. The volume of material collected so far in 1988 indicates that the volume could more than double the 1987 volume. However, this still represents only 0.66% of Vallejo's municipal solid waste. Vallejo Garbage expects to have a second truck in operation by 1989, and intends to start glass collection from bars and restaurants. The potential for the expansion of this program is very high, but studies completed in the San Francisco Bay area indicate that substantial reductions in the waste stream do not occur until a true curbside program is implemented.

To estimate the potential waste diversion that could be expected from curbside recycling in metropolitan areas, the goal established by Contra Costa County of 12% of residential waste can be used. With an estimated waste generation rate of 2.5 ppcd, the combined population of Vallejo, Fairfield and Vacaville could be expected to produce 102,246 tons per year. A 12% recycling

rate (assuming 50% participation) would divert 12,270 tons from the waste stream, or 3.4% of the total waste stream (municipal solid waste + sewage sludge + currently recycled material).

In the short term, a feasibility study for curbside collection is proposed, which may result in pilot projects. Therefore, actual implementation of full-scale curbside recycling cannot be anticipated until the mid-term, with a potential expansion in area to include Benicia, Dixon and Rio Vista in the long term.

Commercial and Institutional Recycling

The greatest potential for commercial and institutional recycling lies in paper, newsprint and cardboard. From Table III-1, an estimated 20,000 tons of cardboard are going to landfills. From Table IV-1 (p. IV-16), survey results indicate only 8,971 tons are recycled. This is undoubtedly low, due to inadequate information, especially regarding retail cardboard recycling. Paper recycling represents an even greater potential for recycling, since it is estimated to be 98,000 tons with only 691 tons currently recycled. In comparison, newsprint disposed is estimated at 27,000 tons, with 2,221 recycled.

Current programs of paper recycling are operating in the Vallejo City offices, at Travis Air Force Base, and in various businesses. A program will begin shortly in the Solano County offices, with collection and recycling services provided by Solano Garbage. The expansion of paper recycling depends upon public awareness and the interest of garbage collection companies. The Resource Recovery Committee could provide information on paper recycling, market prices, and names of paper brokers to stimulate increased paper recycling practices.

In the short term, the County proposes to undertake a waste composition study and an expansion of the survey of recycling practices in the commercial and institutional sectors. This should result in improved knowledge of the types and quantities of waste produced, the types of programs that could successfully increase the rate of recycling, and the obstacles to increased recycling.

Oil

One of the most common questions asked of recycling facilities is where to take used motor oil. In the past few years, the number of oil collecting sites has decreased as the price of oil dropped and insurance rates increased. California hazardous waste laws allow recycling programs to accept used motor oil under certain conditions without obtaining hazardous waste permits. The motor oil must be delivered to the recycling facility by the household generator in amounts of no more than 20 gallons and in containers no larger than 5 gallons. The recycling facility operator may transport it from his satellite depots to his own central facility without a hazardous waste transport permit. Local regulations govern approval of the storage tank at the recycling facility. Materials may be stored for a maximum of 90 days. The used motor oil is collected from the storage tank by a licensed waste oil hauler and delivered to a refining plant. Facilities for receiving used oil must be increased throughout the County. It may be possible to add collecting tanks to corporation yards so that the tanks are within the yard to stop vandalism, but accessible to the public.

Composting

As an example of composting, the city of Vacaville and Vacaville Sanitary Service have jointly purchased a chipper to process brush. This material is being used as a mulch to dress creek banks throughout the city. A study to determine the feasibility of implementing a composting operation in either Fairfield or Vacaville using leaves and tree trimmings gathered by municipal work crews will be undertaken.

Potrero Hills Landfill will conduct a study of composting on the landfill as part of its County Solid Waste Facilities Permit. From Table III-1, it is estimated that garden wastes represent 13.9% of municipal solid wastes. For the Potrero Hills landfill, this estimated quantity would be 14,900 tons. Of this, the landfill operator estimates that only 20% is separable and can be

chipped for composting. The usable amount would be approximately 3,000 tons/year. The landfill operator has not yet estimated the anticipated need for compost to provide a final cover for the landfill. Additional sources of compostable material may be needed. If the usable portion of garden wastes taken to Potrero Hills were composted, it would reduce it's wastes disposed by 2.8%. The total County waste stream would be reduced 1.0%.

Recovery at Landfills

Present salvage operations at Potrero Hills Landfill and B & J Sanitary Landfill will continue or expand during the short term planning period. Significantly increased salvaging rates cannot occur until the medium or long term, when increased waste quantities will make equipment purchase cost effective. Mechanized recovery of recyclables could be combined with a waste to energy plant.

Vallejo Sewage Sludge Composting

Sewage sludges from most cities in Solano County are disposed in landfills. However, the largest generator of sewage sludges, the City of Vallejo, uses their sludges as soil amendment to improve the agricultural potential of land on Tubbs Island. The addition of the sludges improves the fertility and the pH of the soil so that livestock feed crops can be grown in soil that would not support these crops otherwise. Total County generation of sewage sludges is 33,800 tons/year. The Vallejo project composts 20,000 tons/year or 59%. This situation is expected to remain static. Because of potential problems with contaminants, there are no proposals for expanding this technique in other cities.

Waste to Energy

Feasibility studies for materials recovery and/or waste to energy projects being undertaken by the collectors in the area will be monitored by the County. Sufficient waste quantities are not available at present nor is there sufficient lead time to construct these facilities during the short term period. Efforts

should be undertaken to consolidate sufficient wastes to make materials recovery necessary and energy recovery facilities feasible.

By 1995 the wastes disposed at Potrero Hills and B & J Landfill are expected to exceed quantities necessary for a waste to energy facility. The construction of such a facility at each of these sites would have a great impact on the quantities of wastes disposed in landfills. However, this type of waste stream diversion is not considered by the Solid waste Management Board as a type of recycling. Recovery of recyclables at such a plant is feasible and would meet recycling requirements.

Public Education

A public information program will be continued. Developed under the guidance of the Resource Recovery Advisory Committee, its purpose is to promote recycling, markets for recyclables, and use of recycled products. The committee has decided to act as an information facilitator for the implementation of AB 2020, the new recycling law. The Committee produced the Solano County Recycling Guide in the spring of 1987 listing all recycling facilities; the guide was distributed throughout the County. Revisions will be made as the certified recycling facilities from the new recycling law become operational. Other activities include: a Resource Rally, informational brochures mailed with utility or garbage bills, and participation in California State Division of Recycling and/or Waste Management Board events.

Litter Control Programs

The county should have a greater emphasis on litter control. Operation Brightside and the Inmate Litter Control Program are excellent examples of programs that should be reinstated or continued. The Waste Management Board has a directory of local programs in counties and cities (CLEAN Local Program Directors)and procedures, ordinances, etc. for implementing litter control programs. The new recycling law, provides that 10% of the unredeemed funds be used for grants to local community conservation

TABLE IV-1 PRESENT RESOURCE RECOVERY PRACTICES

QUANTITIES BY SOURCE IN TONS/YEAR

Type of Material	Garbage Companies[1]	Commercial/ Institutional[2]	Indep. Recyclers[3]	Total
Cardboard	1,634	5,934	1,403	8,971
Paper	-	487	204	691
Newsprint	780	-	1,441	2,221
Glass	286	2,875	579	3,740
Metal	-	1,402	2,000	3,402
Aluminum	61	4,141	1,689	5,891
Wood	-	3,659	-	3,659
Oil	20	354	-	374
				28,949
Vallejo Sewage Sludge	-	-	-	20,000
TOTAL	2,781	18,852	7,316	48,949

1 Garbage collection companies reporting recycling: Vallejo Garbage, Solano Garbage, Vacaville-Dixon Sanitary.

2 Includes all commercial, industrial, and institutional recy cling reported to the County during the survey process.

3 Includes profit and non-profit operations such as M & M Paper Recycling, Atlas Metals, VALCORE, Vacaville Recycling Cen ter, and Wheeler Enterprises.

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corps programs for recycling and litter abatement activities. The local conservation corps office for this area is in Napa. Another 5 percent of the unredeemed funds will be used for public education grants to local government community conservation corps programs, public and private agencies, and statewide nonprofit organizations. Projects that may qualify for funding are: litter abatement programs, community beautification, and public education. This would be an excellent opportunity to fund more litter control programs for Solano County.

Recycling Goals

For the purpose of calculating recycling goals, the total waste stream is assumed to consist of municipal solid waste, sewage sludges disposed, and the wastes that are currently recycled. Food processing wastes, drilling muds, hazardous wastes other than oil are not included in the totals, since they normally are not disposed in a municipal landfill. The total municipal solid waste going to landfills in Solano County is 303,000 tons/year (Table III-4); the total sewage sludge disposed is 13,760 tons/year (Table III-6); and the total quantity of wastes recycled is 48,949 tons/year (Table IV-1). Therefore, the total waste stream is 365,700 tons. The percent currently recycled is 13.4%.

The estimated increases that could be achieved in the short, medium, and long term are presented below (Table IV-2). The estimates are based on a reasonable expansion that could be expected from existing programs, with the addition of curbside recycling in the medium and long term. With the completion of a feasibility study and the expected growth of the Vallejo mobile buyback program, it is reasonable to assume that curbside collection could be established in the three largest cities in the medium term and be extended to all the residents of incorporated areas in the long term.

The potential for increasing commercial and institutional recycling is more uncertain, since current quantities and types of wastes generated are not well known and the County's ability to

influence recycling in the private sector is not certain. However, cardboard and paper recycling should offer strong opportunities, since cardborad is easily separable and paper represents such a large portion of the waste stream.

TABLE IV-2 RECYCLING GOALS

Short Term Goals (1987-1992):	
Commercial recycling (paper & cardboard)	2.0%
Existing recycling centers and new AB 2020	2.0%
Composting at Potrero Hills	1.0%
Salvaging at landfills	.5%
Current recycling rate	13.4%
TOTAL for short term	18.9%
Medium Term Goals (1992-1997):	
Curbside recycling (Vallejo, Fairfield, Vacaville)	3.4%
Commercial recycling (5% of paper disposed)	1.0%
Composting at Potrero Hills (additional source of material)	1.0%
Independent recycling centers, including AB 2020	1.0%
	6.4%
Recycling after Short Term	18.9%
TOTAL for Medium Term	25.3%
Long Term Goals (1997-2007):	
Curbside recycling (all incorporated areas, including unincorporated islands in Vallejo)	4.1%
Recycling after medium term	25.3%
TOTAL for Long Term	29.4%

PART II. RESOURCE RECOVERY BACKGROUND

Background information for various resource recovery techniques including their advantages and disadvantages were provided in the 1978 plan. Since it is almost ten years later, the material has been revised and added as Appendix B to this update of the Solid Waste Management Plan. The following section will focus upon some of the more significant changes in resource recovery techniques.

Recycling

Since the Solid Waste Management Plan was implemented in 1978, additional information and data on recycling techniques including recycling facilities and curbside recycling have become available. Recycling is a method of decreasing the amount of wastes by removing items from the waste stream before they are landfilled. It can take place at the point of generation (curbside recycling or collection boxes in home), at any intermediary point (transfer stations and recycling centers), or at the disposal sites.

Curbside Recycling

Curbside recycling is an effective method of source separation involving the collection of pre-separated materials from the residences on a scheduled date. Curbside recycling is beneficial to the refuse collector in that it can save tipping fees, extend the number of collection stops prior to filling the truck, and reduce the weight of each can carried. It is beneficial to the residents as it is convenient and contributes to a positive environmental attitude.

Several communities in California presently conduct curbside recycling programs including the cities of Palo Alto, El Cerrito, Berkeley, San Jose, Santa Rosa, Sunnyvale, and Davis. A city might establish curbside recycling through negotiations with the collector who holds the waste disposal franchise within the city's jurisdiction or a private company.

There are two types of curbside recycling systems. One is a curbside collection separate from refuse collection, and the other is an integrated collection where the same truck is used to pick up recyclables and refuse. The most common integrated method is the collection of newspapers with the regular collection of residential refuse. Additional revenue is usually needed to augment the curbside program. Monthly per residence fees run from 40 cents to $1.15 currently. As the number of residences recycling increases and the recycling law is implemented, curbside recycling may become more cost effective.

Recycling Center Facilities

The establishment of recycling facilities is another source separation method. Compared to curbside recycling, recycling facilities are less convenient for waste generators and, therefore, less likely to receive participation without an active public relations campaign. Recycling facilities, until the implementation of AB 2020 in October 1987, have been of two types: dropoff or buyback centers. Dropoff centers provide a place for individuals to leave their recyclables without being paid for the material. They are usually operated by nonprofit organizations and the recyclables are a source of income for the nonprofit group(s). Buyback centers purchase and may process recyclables. Most of these buyback facilities probably will continue to operate after the implementation of AB 2020. It is questionable what will happen to the dropoff centers after October 1987.

According to AB 2020, a recycling facility is a center for the collection and/or processing of recyclable materials. A certified recycling facility or processor is a facility certified by the Department of Conservation as meeting the following requirements:

1. redeems the four types of beverage containers
2. open at least 30 hours a week
3. at one location
4. pays at least the redemption values prescribed by the

State

5. five of 30 hours must be other than Mon-Fri, 9 a.m. - 5 p.m.

Other definitions in the recycling law describe a collection facility as a center for the acceptance by donation, redemption, or purchase of reclaimable materials from the public. Such a facility does not use power-driven processing equipment. Examples are: reverse vending machines, facilities under 500 square feet, (mobile)unit, bulk reverse vending machines, kiosk units, unattended containers for donations and facilities of more then 500 square feet.

A processing facility is a building or enclosed space for the collection and processing of recyclable materials. Processing means the preparation of material for efficient shipment or to meet an end-user's specifications.

Collection of recyclables can also occur at transfer stations or disposal sites. This can be accomplished by placing containers for newspaper, glass, and metals at the site entrance to encourage recycling by individuals hauling their own wastes. Salvaging, the picking of recyclables from the waste prior to disposal, is another technique. Salvaging is practiced at both Potrero Hills Landfill and B & J Sanitary Landfill in the County.

A third technique is materials recovery or front end systems; these systems process the mixed solid wastes found in collection trucks in an effort to recover potentially valuable materials for recycling. Such material recovery systems are best utilized in conjunction with a transfer station or energy recovery system.

Commercial and Industrial Segregation of Paper

Source separated cardboard from commercial and industrial business organizations is another type of material that can be recycled. At present, the Vallejo Garbage Company, Solano Garbage Company, Dixon Sanitary Service, Vacaville Sanitary Service, and numerous independent recyclers are collecting cardboard on a

regular basis. Examples of participating businesses are the large supermarkets and drugstores.

Location of Processors

Transportation costs hinder recycling, because of the typically low profit margins involved in buying and selling recyclables. Dispersed processing plants could reduce these costs, thereby promoting profitability. Economic development corporations in the county and cities should examine the potential for recycling industries in the county. Technology is constantly changing in these industries, but at this time several industries are promising, in particular newspaper de-inking and plastics recycling.

Used Oil Recycling

Recycling used oil is another means to conserve energy resources. Used oil can be processed and refined to be used as fuel, lubricating oil, and road oil for asphalt production.

SOAR, Save Oil America, Recycle, is a used oil recycling program directed by the California Waste Management Board. Gas stations, stores and recycling centers currently serve as SOAR collection points where "do-it-yourself" oil changers can bring their used automotive oil for recycling. In the 1983 plan there were 22 collection sites in the County; this number has now been reduced to five sites. Major used oil recyclers in the county include the major industries, such as Anheuser Busch and Lucky's; car dealerships; garbage companies; service stations; transit; city, county and federal governments; and utility companies.

The availability of the SOAR centers has decreased due to declining oil prices. With an increase in oil prices, it is anticipated that collection centers would be reestablished. There needs to be an outlet and permanent facilities for used oil recycling in the county. The County Hazardous Waste Management Plan will provide an avenue for encouraging and/or stipulating the establishment of used oil facilities.

Markets for Recyclables

Previous sections have described the recycling techniques and facilities that could potentially be developed during the time span of the Plan. However, a primary constraint to successful implementation of all these recycling techniques is the market for the recycled materials. This section describes some of the current market conditions and market constraints.

Recycling programs depend upon the availability of stable markets. This section provides a brief survey of local market conditions for the more common types of wastes recycled in Solano County: cardboard, newsprint, high grade paper, metal, aluminum, glass, and used oil.

High Grade Paper The prices for computer print-out and white ledger (office) paper continue to be influenced by export demand. Prices have fluctuated considerably in the last two to three years and are currently at a high point. Computer print-out paper has ranged from $135 to $220 per market ton*; white ledger paper has run from $75 to $150* per market ton. While prices can be expected to continue fluctuating, there will be a consistent outlet. M & M Recycling in Fairfield purchases these materials. (*Source: M & M Recycling)

Corrugated Price per Ton*

($/ton)

	Foreign	Domestic	To Public
10-12/85	$70	$65	$20
1-3/86	70	65	20
4-6/86	70	65	20
7-6/86	90	70	35
10-12/86	85	65	35
1-3/87	85	65	35
4-6/87	118-129	60-123	50-84

*Source: California Waste Management Board Quarterly Review of Recyclables Market: April-June, 1987

Corrugated While market conditions will fluctuate, it appears that the demand for corrugated will remain strong in the long run. The primary factors that will lend stability to the market are the recent increases in capacity of West Coast mills using corrugated and the continuation of a strong export demand in the Far East. There are numerous paper mills and brokers in the Northern California area that purchase baled corrugated. M & M Recycling, Vacaville Sanitary Service Recycling, Dixon Sanitary Service Recycling, and B & J Landfill Recycling all purchase corrugated and bale it for shipping. United Fibers in Benicia purchases corrugated.

Newspaper Price per Ton*

($/ton)

	Foreign	Domestic	To Public
10-12/85	$55	$45	$15-20
1-3/86	65	55-60	25
4-4/86	65	45-60	25
7-9/86	60	45-55	25
10-12/86	55	45	20
1-3/87	82	78	40-50
4-6/87	40-90	40-80	30-50

*Source: See Corrugated

Newspaper The largest market for sorted de-ink newspapers is Smurfit Newsprint in the Portland area. There are several brokers in the Bay Area that buy for this mill, as well as for local mills that use Boxboard Newspapers (unsorted.) M & M Recycling, Vacaville Sanitary Service Recycling, Dixon Sanitary Service Recycling, B & J Landfill Recycling, and United Fibers all purchase newspapers. A newspaper de-inking plant in the area would reduce transportation cost for local recycling facilities.

Used Oil Price per Gallon*

($/gal)

	End Markets	Collection Stations
10-12/85	$.50 to 0.55	$.25 to 0.35
1-3/86	.15 to 0.20	.00 to 0.05
4-6/86	.15 to 0.20	.00
7-9/86	.15 to 0.20	-.25
10-12/86	.12 to 0.15	-.25
1-3/87	.12 to 0.15	-.25 to -.50
4-6/87	.12 to 0.15	-.20 to .00

*Source: See Corrugated

Used oil is presently not a source of revenue. Oil that is collected is recycled by a refining process.

Metals Price Per Pound*

($/lb)

#1 Copper	$.40 + per pound
#2 Copper and Brass	.30 + per pound
Aluminum Scrap	.25 + per pound
Stainless Steel	.12 to .15 per pound

*Source: Atlas Metals

Metals are purchased by Atlas Metal in Fairfield. Representative prices for non-ferrous metals recycled locally are indicated above. There appears to be little market for tin cans at the present time.

Aluminum Cans Price per Pound*
($/lb)

	To Public	To Collection Centers
10-12/85	$.12 - .20	$.25 - .30
1-3/86	.20 - .30	.35 - .40
4-6/86	.16 - .25	.30 - .35
7-9/86	.16 - .25	.30 - .35
10-12/86	.10 - .20	.28 - .33
1-3/87	.20 - .32	.42 - .43
4-6/87	.20 - .35	.33 - .48

*Source: See Corrugated

Aluminum cans are purchased by a number of companies, recycling facilities, and reverse vending machines. Large, regional buyers include Atlas Metals, Reynolds Aluminum, and local beer distributors. Cans can also be redeemed at all certified redemption facilities and anywhere else where they are bought. Prices for the cans have been fluctuating for the last five years, but gradually rising. Prices in 1987 were high. The effect of therecycling law on the market is yet to be determined since it is just being implemented.

Glass Price per Ton*
($/ton)

	To Public	To Collection Centers
10-12/85	$ 25-30	$ 55-70
1-3/86	25-30	55-70
4-6/86	25-30	55-70
7-9/86	25-30	55-70
10-12/86	25-30	55-70
1-3/87	25-30	55-70
4-6/87	20-40	15-70

*Source: See Corrugated

Glass The relatively high price paid for recycled glass is due to the demand of manufacturers who find advantages in using waste glass in the manufacture of new glass. Using waste glass reduces energy and other operating costs in the manufacture of new glass. Using waste glass in making new glass keeps natural gas costs down because waste glass has a lower melting temperature. Using waste glass also helps glass plants achieve acceptable air emission levels.

Glass is purchased by certified recycling facilities and processors in the County. Atlas Metals is a regional processor for glass. This market will also be affected by the implementation of the recycling law.

Historically, recycling has been dependent on unstable markets determined by supply and demand factors. Multi-material recycling centers, that accept all recyclable materials regardless of market value, have been particularly vulnerable to market fluctuations. Other factors that affect prices are:

- The amount of processing and transportation cost to be borne by the seller rather than by the buyer affects the price paid. When the collection center bales, sorts, or otherwise processes the material, the center can command a higher price. When the center pays the cost to haul the material to the buyer, a higher price is paid.

- The volumes being sold also influence the prices paid. A recycling center that sells large volumes of material on a regular basis may be paid a higher price than a center that sells only small lots.

- Finally, loyalty between buyers and sellers is a factor. Some centers deal with the same buyers year after year on the understanding that the buyers do not pay the highest possible price when prices are high nor the lowest price when prices are low. Such sellers stay with their buyers because those buyers provide reliable markets for the seller's recyclable wastes.

To help overcome these barriers the Plan includes a policy promoting the development of markets for recyclables. During the short term period, the major catalyst for market development is the Resource Recovery Advisory Committee.

Public Education for Recycling

Success of the recycling program is also dependent on participation by the public. Therefore, the Plan proposes the continuation of an information program and a public relations campaign to educate the public about the importance of recycling and to encourage participation in recycling programs. The Plan envisions

this to be one of the principal functions of the Resource Recovery Advisory Committee. This information can be conveyed through brochures, press releases, telephone listings and advertising, public service announcements and school recycling programs. Promotional assistance and support from organizations such as the League of Women Voters, Sierra Club, beverage distributors, schools and cities should be actively sought.

Waste Reduction

Waste reduction is defined by the California Waste Management Board as the prevention of waste at its source by influencing changes in societal patterns of consumption, encouraging modification of production practices, and redesigning of products and packaging. Local government can play a significant role in encouraging waste reduction activities by its procurement actions.

Among the procurement activities that local governments can use to reduce waste are: purchase of recycled paper stock, refined motor oil, and retreaded or radial tires; purchase of copy machines that print two-sided copies. Policies can be adopted that favor products that are durable, easily repaired, produced from secondary materials, and energy efficient.

Concerned citizens and local governments can also encourage waste reduction by others. Some of the actions that can be taken are as follows:

- Encourage adoption of a variable rate structure for garbage collection that encourages waste reduction and recycling.

- Provide discounted disposal rates for those customers who donate materials in recycling programs.

- Work to attract and recruit industries that can transform local recyclable materials into new retail products.

- Establish property rehabilitation programs for furniture, typewriters and other office machines.

- Reduce the quantity of paper by using smaller business forms, micro fiche and billing envelopes that can be used to transmit remittances.

Material Recovery Facilities

Several front end (material recovery) systems have been developed including hand picking and sorting, shredding, air classification, wet or dry processing, and magnetic separation. Among these, magnetic separation has been the most technologically and economically feasible. Material recovery systems are best implemented in conjunction with a transfer station and an energy recovery system and should be considered along with these proposals.

Municipal Composting

Municipal composting is the controlled biological decomposition of large amounts of vegetative, organic wastes to relatively stable, humus-like materials. Decomposition occurs through successive utilization of the materials by bacteria, fungi, protozoas, insects, worms and other organisms. The final compost product is useful as a soil amendment. It improves soil texture, increases air and water-holding capacities, decreases erosion, regulates soil temperature, and adds some nutrients.

Municipal composting can involve vegetative wastes, mixed municipal refuse, sludges, and/or other organic wastes. Because organics constitute such a large proportion of California's municipal solid waste stream (over 60% in most urban areas), municipal composting has significant potential for reducing the waste stream. However, separation of compostable material from contaminants presents a significant impediment to using wastes in this way unless separation is done at the source. Composting can be done at home using garden clippings and kitchen wastes, or on

a large scale using vegetative wastes from a community and/or agricultural wastes.

Local uses of compost that benefit the community include soil improvement in public parks, golf courses and sports fields, landscaping along highways and around public buildings, and use in home gardening and landscaping. In some cases the compost product can be sold to local markets or users, thus recovering part of the costs of the composting process. Such markets include agriculture, horticulture nurseries, and land reclamation. Additional benefits of municipal composting include the reduction of vector and odor problems at the disposal site.

Energy Recovery

Technological advances in resource recovery continue at a rapid pace. Improved and new technologies for energy recovery have been developed; however, energy costs have leveled off thereby influencing the economic feasibility of projects. Concern still exists as to the risks imposed on the environment by waste to energy plants. These changes are described in more detail in the following sections.

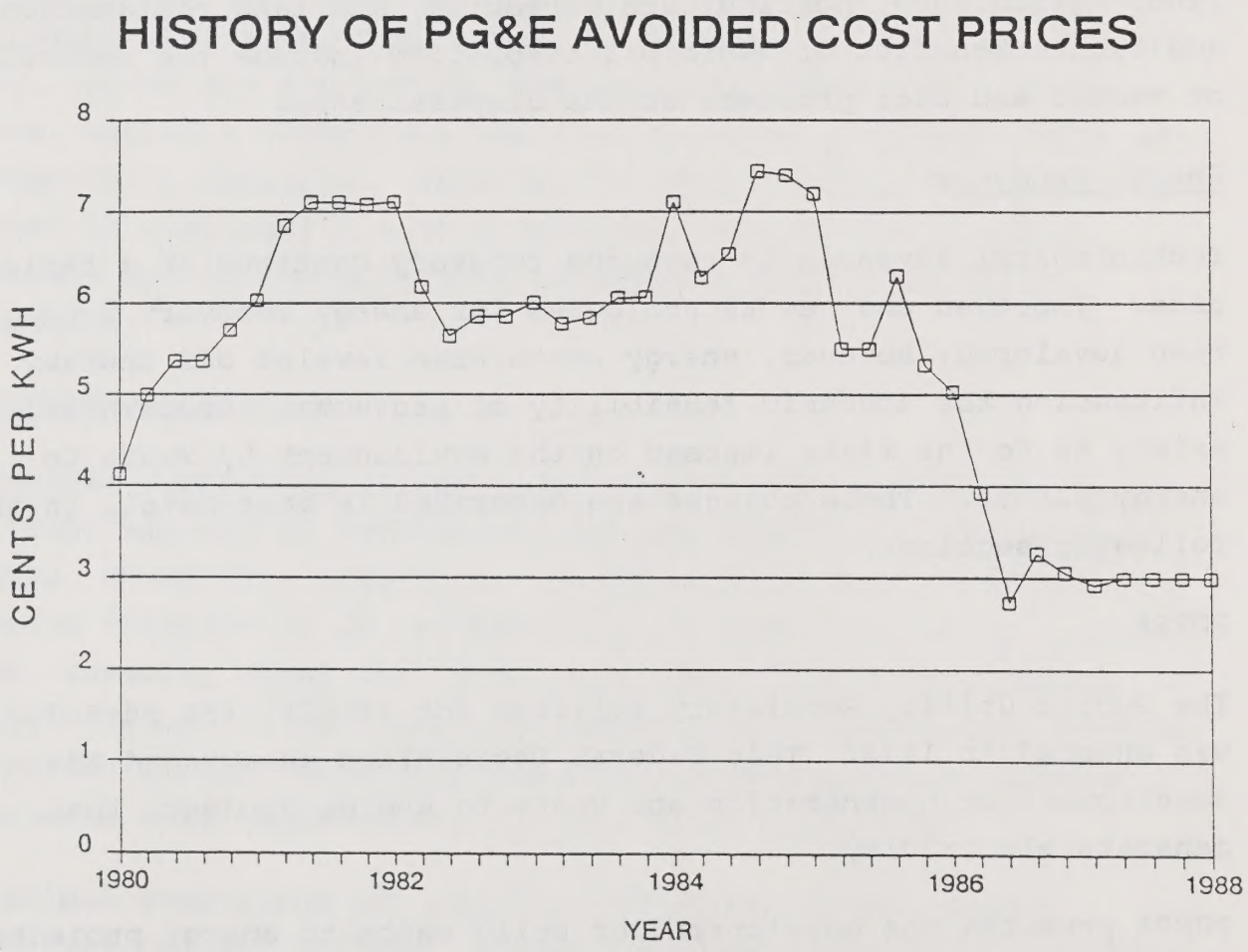
PURPA

The Public Utility Regulatory Policies Act (PURPA) (PL 95-617) was enacted in 1978. This Federal Legislation encouraged the development of cogeneration and waste to energy projects that generate electricity.

PURPA promotes the development of solid waste to energy projects through three elements:

- requires regulated electric utility companies to interconnect their power lines with small-power producers who request interconnection.

Figure IV-1


HISTORY OF PG&E AVOIDED COST PRICES
CENTS PER KWH
0
1
2
3
4
5
6
7
8
1980
1982
1984
1986
1988
YEAR

- mandates that a minimum rate of "avoided costs" (what the utility would have otherwise paid for new production) be paid to small-power producers for the electrical energy they feed into power company lines.

- exempts small-power producers from laws regulating utilities, therefore promoting the development of small-power producers.

The State of California Public Utilities Commission took a similar action at an earlier date. This is important because it sets a state policy of pursuing energy production opportunities offered by small cogenerators and would remain effective even if the federal act were repealed. Due to the current availability of excess power, the Public Utilities Commission and California Energy Commission are considering revising state policy.

Energy Cost

Costs of electricity, natural gas, and fossil fuel have dropped from the high levels experienced in the early 1980's. Earlier, in conjunction with PURPA, the high energy costs increased avoided costs and the resulting high potential energy revenues from waste to energy projects thus improving their economic feasibility. Rising energy costs also made recycling more attractive because of energy savings attained by producing a product from recycled materials.

Currently, fluctuating prices of imported oil and the deregulation of natural gas have been affecting the feasibility of waste-to-energy plants. The fluctuations in these economic factors create uncertainties in the investment community regarding the future energy sales revenues.

Figure IV-1 represents past prices PG&E has established for purchase of electricity from small power producers including waste to energy plants.

Emissions from waste to energy plants have been reduced in the various plants built recently on the west coast. Significant obstacles still existing are:

- health risk assessments for new facilities are required by State law.
- another State law requires that commitment of wastes to the plant not preclude recycling.
- citizen concern about health risks from toxic emissions and from increasing disposal costs.

Based upon these issues and uncertain energy prices, the economic and environmental feasibility of waste to energy plants has changed.

Energy Recovery Processes

In recent years, the field of energy recovery from solid wastes has experienced a proliferation of available technology. In this section, various technologies are reviewed.

Pyrolysis

Pyrolysis is a gasification process where wastes are oxidized in the absence of air. In the 1978 Plan, pyrolysis was considered a promising waste to energy technology. Now pyrolysis shows little prospect of being feasible.

Modular Waste to Energy Systems

A number of small systems burning waste to generate steam are in operation in several locations throughout the world. These systems have been considered by both Solano Garbage and Vacaville Sanitary for installation to serve their respective collection areas. However, there has been no recent work on projects because of economic considerations.

Agricultural Biomass to Energy Projects

Considerable research and development has been accomplished in converting agricultural biomass to energy. Techniques have been developed for converting rice, straw, cotton gin wastes, orchard prunings, peach pits, and walnut shells to energy (including electricity and alcohol fuels). While the technological aspects of these projects has improved, economic viability has declined in the last few years based on market conditions.

A project that appears to be successful is operated by Diamond/ Sunsweet, a processor of fruits and walnuts. The company creates steam power in boilers to generate electricity and heat at its plant in Stockton by burning walnut shells, a crop residue of walnut processing. This plant generates enough electricity for its own use. A similar facility for processing almond hulls is being operated successfully in Sacramento by the California Almond Growers Exchange. There are currently thirteen projects in California that are either operational or under construction. None of these sites are in Solano County. Thirteen more plants are in the planning/permit phase. Cherry, prune and peach pits, and wood chips could also fire these types of plants.

Because the technology in this field is changing rapidly, it will be necessary to occasionally reassess the overall energy recovery potential from agricultural residues.

Landfill Gas Recovery

Municipal solid waste generates a variety of gases as materials decompose at a landfill site. One of these gases is methane, a potential recoverable energy resource. Methane gas production varies from landfill to landfill. It is dependent on the age and types of wastes and moisture in the landfill. A commercially feasible project must have 1 million tons of refuse in place and the landfill depth must be over 30 to 40 feet.

American Canyon Landfill in Napa County has been producing electricity from landfill gas since 1985. B & J Sanitary Landfill will soon have the potential for methane recovery and by 1994 Potrero Hills Landfill will have the needed one million tons in place.

PART III. RESOURCE RECOVERY ALTERNATIVES

Various resource recovery processes and techniques are described in the Resource Recovery Systems Appendix. Among the numerous resource recovery techniques and processes, several appear to be applicable to Solano County. These include curbside recycling, recycling centers, and vegetative waste composting. Energy recovery through incineration of municipal solid wastes and agricultural residues, alcohol production from agriculture residues and food processing wastes, and landfill gas recovery require further economic study and environmental analysis.

Recycling Alternatives

Some of the types of recycling possible include curbside recycling programs and pick up at the residence. These types of recycling have good potential for implementation in Solano County. They provide an effective method of increasing the proportion of wastes recovered. Such programs are technologically feasible, raise environmental awareness, and involve short lead times for development. They can also serve to preprocess solid waste for future solid waste-to-energy systems by removal of noncombustible recyclables. Compared to energy recovery projects, the various types of residential recycling require less capital for development.

There have been many changes in the recycling businesses in the County during the last four years. Several of the recycling businesses or nonprofit groups listed in the 1983 plan have ceased their recycling operations. As the recycling law is implemented in 1987-88, more changes will occur. At first, there will be many more recycling facilities and methods of recycling available. As market forces stabilize in the following three or

four years, a different pattern of recycling operations will evolve.

Currently recycling in the County cannot be measured accurately. There is an increased reluctance to release statistics on tonnage of recycled materials in certain industries and government agencies. With the recycling law, the County will be able to accurately track the tonnage of the four redeemable beverage containers recycled in the County. Appendix A contains a partial list of recyclers in the County and the tonnage of recyclables in various categories. Table IV-1 summarizes this information.

Detailed studies have been conducted on separate curbside collection systems. A 40-50% participation rate can be expected for a well developed curbside recycling program. The starting costs for developing a separate curbside system can vary depending upon the types of vehicle and equipment used. The equipment required for the system includes recycling containers, collection vehicles, unloading equipment (fork lift) and processing equipment (can processor or baling equipment).

Because of variations in such factors as the frequency of collection (weekly, bimonthly, monthly), staffing and the time allocated for collecting material, it is difficult to estimate more than rough operational costs of a curbside recycling program. The experience of several cities with curbside recycling programs indicates that the operational expenses of curbside recycling system may be offset by revenues from the sale of recyclables.

It is estimated that separate curbside recycling systems are potentially cost effective in the Vallejo, Vacaville-Dixon and Fairfield-Suisun planning areas in the short term to mid term planning period. In the other planning areas of Benicia and Rio Vista, curbside recycling appears not to be cost effective since sufficient solid waste volume is not available.

A simple, less expensive, integrated form of recycling could be considered in the short term period for Rio Vista and Benicia.

The integrated system could, for example, involve equipping existing collection vehicles for curbside collection of newspapers only. In order to implement curbside systems, the cities and/or the County's collectors should seek money to establish some type of curbside recycling prior to the medium term planning period. Curbside recycling could be established irrespective of community size.

Impact of the Recycling Law

To supplement curbside recycling, drop-off facilities should be established in all of the cities in the County in the short term planning period. These facilities can augment certified facilities and might be sited in city corporation yards or other sites convenient to both the waste generator and the buyer/recipient of recyclables. They would be equipped with containers to collect several types of recyclables and could be managed by waste collectors and/or non-profit organizations. The dropoff sites would handle recyclable items not collected by certified recycling centers as well as the redeemable beverage containers. It is not known what the participation rate will be for the redeemable containers during the first years of implementation.

Composting Alternative

As described in Part III, composting is a biological process by which certain vegetative organic wastes (kitchen wastes and plant trimmings) can be turned into a nutrient-rich soil conditioner.

Vegetative waste composting is probably the most commonly used form of municipal composting, and compared to the composting of refuse and sewage sludge, is more environmentally acceptable. On a small scale, it is being used by homeowners to produce compost for application on lawns and gardens. On a large scale basis, it has been undertaken by at least five California cities (Palo Alto, Davis, Sacramento, San Mateo, and Chico). The experience of these cities has demonstrated that it can be incorporated into existing municipal operations. Typically, municipal composting

programs have been conducted by a department responsible for street tree trimming.

Review of current information on composting indicates no significant changes to the technology of composting, and to the market demand for composted solid waste. This finding supports the previous conclusion of past plans that municipal composting on a large scale is not feasible until there is a large demand for composting by the agricultural industry or for a special project. For example, the Berkeley composting program was terminated because processing costs were not offset by sufficient revenues from sale of materials.

Presently municipal composting is used on a limited scale in the City of Vacaville and was formerly used in the City of Fairfield's street landscaping operation. It should be determined through a study whether either of these two cities can economically benefit from a municipal composting operation. Consideration should be given to requesting grant funds from the AB 2020 program to provide capital cost sources. Potrero Hills Landfill will be testing the use of unshredded, composted vegetative wastes on the landfill.

Material Recovery

A limited amount of salvaging is taking place at the Potrero Hills Landfill Company and B & J Sanitary Landfill sites. Metals are removed by company employees and contractors on a consignment basis, and other materials (newspaper and/or cardboard) are salvaged. It is not likely that materials recovery will significantly increase during the short and medium term periods. The cost of machinery cannot be warranted unless wastes are imported from outside the County. Not until the long term planning period will sufficient quantities of solid wastes be generated to support mechanized waste recovery equipment; hand sorting will continue to be the mode of operation. Potential materials recovery systems should be considered concurrently with energy recovery proposals.

Energy Recovery from Municipal Solid Waste

Proposals evaluating small waste to energy projects were evaluated by two of the County's waste collectors, Solano Garbage Company and Vacaville Sanitary Service. The small scale facilities that have been considered are modular, expandable units. Operating facilities can be used as models.

Both Solano Garbage Company and Vacaville Sanitary Service projects anticipated the installation of modular heat recovery combustion systems to generate electricity and possibly steam for industrial use. The system considered is described in the Resource Recovery Systems Appendix. These proposals would require 200-300 tons of waste a day and would produce up to 4.5 megawatts of electricity. If a suitable steam use was developed, electrical output would be reduced. It is estimated that installation of such a system would cost between 30 and 45 million dollars. This includes stationary facilities, necessary mobile equipment, and land purchase. Vacaville Sanitary Service carried its project to the point of seeking permission from the California Pollution Control Financing Authority to issue bonds for financing this project.

At the time the previous County Solid Waste Plan was completed, Solano Garbage Company was proposing to establish its plant in an industrial park in the Fairfield-Suisun Area. Vacaville Sanitary Service considered a plant at the B & J Sanitary Landfill.

Both projects have been tabled at this time and have not advanced to the point where detailed costs and revenues are available. The economic success of the projects would be based on the interrelationship of future energy sales, the necessary tipping fee and the interest rate on the revenue bonds. Presently this relationship does not allow for accurate prediction of feasibility. In the face of declining electricity purchase price values, it is difficult to predict what energy revenues will be at start up. A tipping fee cannot be determined until these revenues are known. In terms of annual costs of operation, it is estimated

that 50% will be used for debt servicing, 15% for labor, 12% for utilities, 6% for maintenance and chemicals, and 8% for residue disposal. Actual annual costs have not been provided by either firm.

Environmental considerations that may affect these projects include air emission levels and competition with materials recycling. Positive aspects of these projects include reduced land fill tonnage and hauling costs.

The type of emissions from refuse combustion depends on the composition of the waste and how the waste is burned. In general, control equipment can adequately regulate particulate and acid gas emissions. The critical air emission questions revolve around the ability to control toxic compounds. Possible air quality impacts from dust and odors within the facility are usually controlled by obtaining the combustion air from the refuse storage area. All systems will be required to meet applicable air quality regulations to mitigate possible air quality impacts; this may include the purchase of air emission offsets.

The ash residue from combustion in the past has been regarded as a Group I waste that must be disposed in a Class I or II-1 landfill. Recent studies have indicated that ash from municipal wastes may be disposed in Class III site with a leachate disposal system. The decision as to where the ash can be disposed is made on a case by case basis by the California Department of Health Services and the State Regional Water Quality Control Board.

As with any industrial use, water supply and discharge must be considered. The plant consumes between 216,000 and 360,000 gallons of water a day for cooling purposes, and it will discharge between 38,400/and 62,400 gallons per day. These considerations will have an impact upon where the plant is located.

One of the major advantages of a waste to energy plant is that it will have a significant impact upon reducing the waste carried to the disposal site. Based upon a 110,000 ton per year plant (300

TPD), approximately 35,000 tons of residue would require landfilling after energy recovery. The volume of waste to be disposed after energy recovery would be even smaller. Materials to be landfilled would include demolition materials, nonprocessables separated prior to the combustion process, bottom ash, and fly ash remaining after combustion process. Both proposals are based upon the economics of a plant capable of processing 300 tons of refuse per day (110,000 tons per year). At present no collection firms in the county handle these quantities of refuse. Solano Garbage Company disposes of 259 tons per day and Vacaville Sanitary Service disposes of 160 tons per day. Waste projections indicate that the Fairfield-Suisun area will be over 300 tons per day in 1992 and Vacaville-Dixon in 1997. Neither firm has proposed importing wastes to make up the necessary quantities, nor have they proposed combining wastes of the two service areas to speed up the time when the threshold will be reached. Unless importation occurs or another fuel source such as agricultural wastes is found, it appears that an energy recovery facility will not be feasible in either the short or medium term planning period. However, all aspects of the project should be monitored to ensure adequate lead times for facility planning.

Monitoring of energy recovery facility proposals should be carried out by the Resource Recovery Advisory Committee on an ongoing basis. Staff would prepare periodic reports on technical advances in waste to energy proposals. Feasibility studies needed to determine the economic and institutional viability of these systems would be conducted by the proponents.

Recovery of Agricultural Residues

As indicated in Part II, technology is being developed for converting agricultural wastes into various forms of energy including gas, fuel oil, charcoal, alcohol and electricity. The County has a large agricultural economic base and is a major producer of fruit and nut, field, and row crops. Most of this agricultural waste is presently burned or cultivated back into the soil. The

County also has several major food processing plants producing processing wastes.

The County's agricultural residues and food processing wastes are potential energy resources that could fuel a waste to energy project. It is recommended that recovery projects from agricultural wastes be monitored, and that the County facilitate sitings of agricultural biomass to energy facilities.

V. ALTERNATIVE PLANS FOR SOLID WASTE FACILITIES

Alternative plan analysis takes into consideration the revised data and updates noted in previous chapters of this plan amendment, including existing facilities and practices, solid waste production, composition and projections, and resource recovery. This chapter identifies the solid waste facilities that would be needed for each of several alternatives considered for Solano County's future solid waste management. Solid waste facilities in this context mean the physical systems required for solid waste disposal sites, transfer stations, waste collection operations and resource recovery plants.

The feasibility of alternative facilities to be evaluated must be related to the changes in waste generated and projected, waste system deficiencies, and other factors as noted in the previous chapters. Alternatives are presented in this chapter after drawing on the updated information and relating potential alternatives to the issues raised by that information. The alternatives are then evaluated based upon economic, environmental and institutional factors, and recommendations are provided.

ISSUES RAISED

Availability of Waste Disposal Sites

Based upon proposals to establish new disposal sites and the re-engineering of existing sites, the 1984 plan proposed a strategy of establishing replacement sites rather than consolidating waste disposal activities. This strategy has been largely implemented so that Solano County currently has sufficient capacity to meet its solid waste disposal needs through the long-term planning period.

An event of major proportions was the establishment of the Potrero Hills disposal site about 1/2 mile from the Solano Garbage Company's landfill on SR-12 near Fairfield. The landfill, which

has been developed as a replacement to the Solano Garbage landfill, will serve the Fairfield-Suisun and surrounding unincorporated area. The capacity of the Potrero Hills site will accommodate wastes for better than 55 years.

Another event of importance was the re-engineering of the Vacaville B & J Dropbox site which increased the projected site life of that facility from the previously expected 14 years to 51-57 years, many years beyond the term of the Solid Waste Plan.

The first major expected change in disposal activities is closure of the Acme Fill disposal site in Contra Costa County which serves the City of Benicia and surrounding area. This is expected to occur in 1989.

There is a strong likelihood that a replacement site for Acme fill will be found. Two privately proposed landfill sites are being considered by the Contra Costa Board of Supervisors. It is not known if these sites will be approved. It is improbable that a new site will be located and established by the time Acme Fill closes in 1989.

A second major change will come with closure of American Canyon in Napa County schedule for 1995-1997. The Tri-County Development Company, comprised of Vallejo Garbage Service, Napa Garbage Service, Envirocal, Inc. and Golden Gate Disposal Co. of San Francisco, proposes to construct a replacement landfill in the Upland American Canyon Area of Napa County (beginning around 1990). The landfill would be developed to serve Vallejo and Southern Napa (replacing the existing American Canyon landfill), well beyond the long-term planning period.

Rio Vista disposal site could also be replaced upon closure. It is expected to reach capacity in 2001. The site is located on government lands and appears to have adjacent areas suitable for expansion as necessary, pending appropriate geo-technical investigation and engineering.

It appears that adequate provisions have been made to find replacements for those sites expected to close during the term of the plan. However, because of the difficulties which frequently surround the solid waste facility siting process, it is prudent to plan for alternative solutions.

Energy Recovery Issues

The updated resource recovery element reinforces the goal of reducing wastes disposed and continues to encourage feasible energy recovery as part of the County's waste disposal system. It continues to support newer type smaller scale modular waste to energy systems and which are expandable. Also, examples of operating units are available for models.

The smaller scale modular heat recovery systems are applicable to the waste loads and circumstances of replacement sites or a consolidated site although waste loads are still not likely to be adequate to implement such systems in the absence of importation until medium term period of this plan.

DESCRIPTION OF ALTERNATIVES

In response to the issues raised in the previous section, feasible alternatives must be tested against a range of criteria to determine the most favorable solid waste facilities plan. In this section, three alternatives are described. These are Alternative "A" Continue existing disposal patterns and Alternative "B" consolidation to two disposal sites with one transfer station. A third, Alternative, consolidation to one disposal site with two transfer stations, was considered in past plans. This has been dropped because there is sufficient in County capacity at the two existing sites to serve disposal needs through the long term planning period.

Alternative A. Continue Existing Disposal Patterns

Increased life spans, newly opened facilities, and new site proposals suggest that more than adequate capacity is available to

serve the County's solid waste disposal needs through the long term. Under this alternative, shown in Figure V-1, the wastes now disposed in various planning areas would continue to be disposed in those areas. Existing sanitary landfill sites both inside and outside the County would continue to be utilized until another nearby site is activated to replace the existing site. For the most part, the existing collection/disposal system for each of the areas would remain intact.

Transport of wastes in this alternative would continue to be by direct haul to disposal sites, with the possible exception of a transfer station in Vacaville (the proposal for a transfer station in Vacaville has been formulated by the collector, and is neither required as a result of disposal site closure nor anticipated in the revised solid waste plan.)

The B & J Dropbox landfill on Hay Road, now re-engineered to have a life span well beyond the plan, would continue to serve the Vacaville-Dixon area.

Rio Vista would have the choice, with the revised anticipated closure of the Rio Vista Landfill in 2001, of creating a replacement site, or transporting its waste either to an out of County site, the Potrero Hills site, or the B & J site.

The Fairfield-Suisun area will continue to be served by the Potrero Hills landfill, the replacement for the Solano Garbage site. This new landfill has the capacity to accept wastes well beyond the long range plan period.

If the American Canyon replacement site in Napa County is approved for operation, it would be available to accept wastes in about 1990. Vallejo, Napa and the other areas now utilizing American Canyon landfill would dispose of their wastes at the replacement site, and the old American Canyon site would remain open for an indefinite period for limited public dumping and possible sewage sludge disposal. Wastes disposed at the replacement site could include importation from other areas in the vicinity

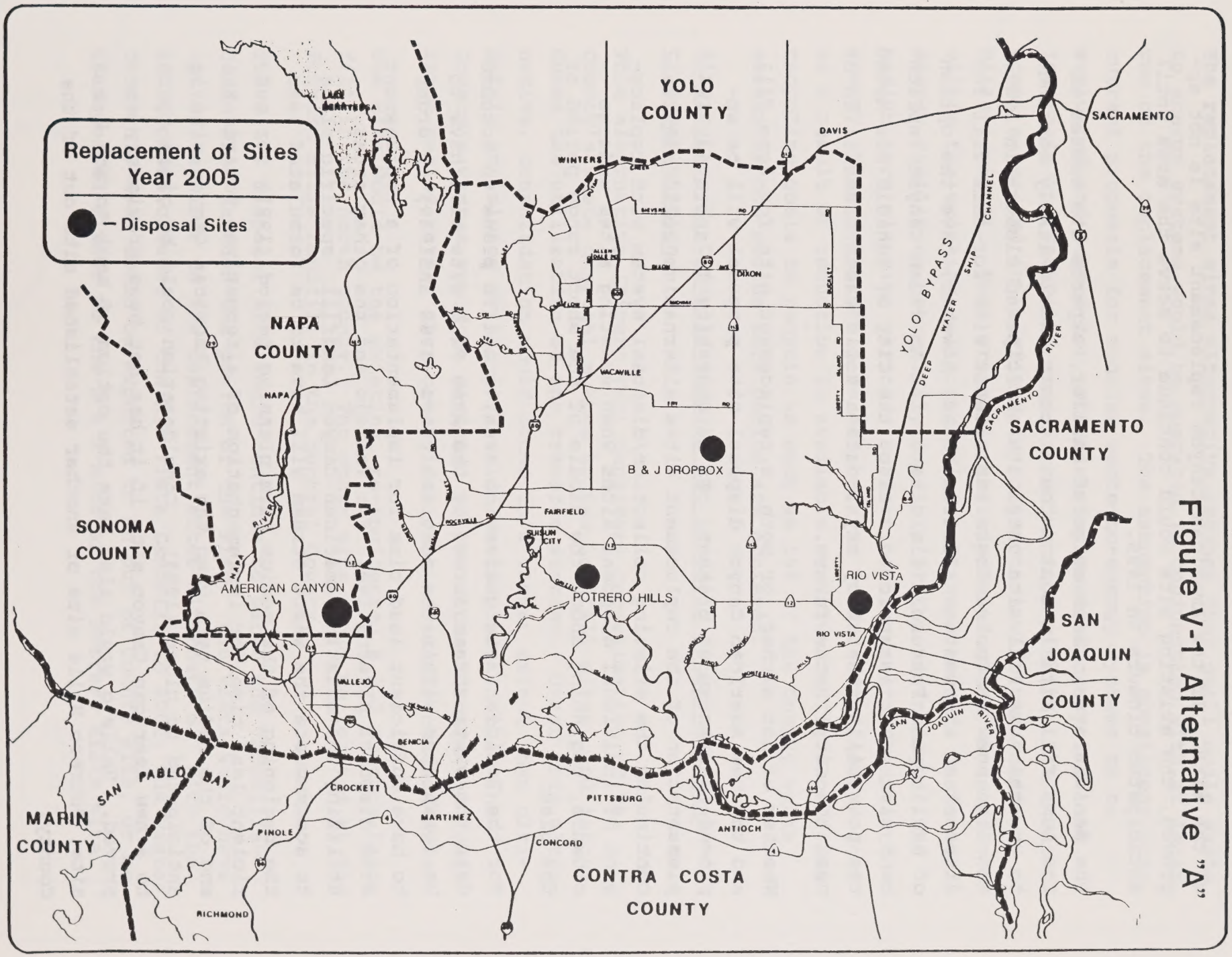


Figure V-1 Alternative "A"

of the site. If the American Canyon replacement site is not approved, the existing site would continue to serve the area until anticipated closure in 1995.

The Benicia area, which as noted earlier, exports its wastes to the Acme Fill site in Contra Costa County, would likely continue to use the Acme Fill site until its anticipated closure in 1989, and then use the Contra Costa replacement site for Acme fill for disposal of its wastes. Benicia would, however, have the option of haul to the Potrero Hills site or the American Canyon replacement site if it is approved. Also, the City of Benicia has noted the possibility that they may locate a solid waste landfill in or near the city in the future.

Whether or not either, or both, a replacement site for Acme Fill and the new American Canyon disposal site proposal will be approved is unknown at present. If neither site is approved, implementation of the replacement sites alternative would require continuing the existing collection/disposal system with replacement of individual disposal sites when existing sites undergo closure, beginning about the middle of the short range period of the plan.

For the Benicia waste collection area, specific plans to accommodate the waste stream served by the Acme Fill site will have to be formulated within the next two years (1988 and1989) in order to have sufficient lead time for implementation of a replacement site disposal alternative. For Vallejo and the other areas, utilizing the existing American Canyon Landfill, specific plans to accommodate the waste stream will have to be formulated near the beginning of the medium term planning period (1992) for sufficient lead time for implementation of alternatives towards the end of the medium term when the existing American Canyon site is anticipated to close (1995). Consideration could be given again to a new American Canyon site if it has not been previously approved. Vallejo would also have the option of haul to the B & J site, Potrero Hills site or another established site out of the County.

The replacement sites alternative assumes that small scale waste to energy systems would be operated in conjunction with at least two of the replacement sites. The assumption is consistent with current proposals for modular waste-to-energy systems to be evaluated and tested for potential implementation by the late 1980's in the Vacaville area in conjunction with the B & J Disposal site; and in Fairfield in conjunction with the Potrero Hills landfill. Both proposals anticipate adequate waste flow within the existing collection/disposal areas to make waste to energy facilities potentially feasible by the beginning of the medium term planning period. However, achievement of waste to energy plant goals could be set back to later in the medium term as a result of reduction in available waste volume if concurrent recycling goals to recycle as much as 18% of the County waste stream by the medium term period are achieved.

Alternative B- Consolidation to two landfill sites, with one transfer station

This alternative (Figure V-2) considers consolidation of the County's waste disposal system to two landfill sites, and introduces the utilization of one transfer station. Under this alternative, consolidation would occur to a lesser extent than ultimately envisioned by the 1978 solid waste plan, in that the County's wastes would be directed to two sites through the long range period rather than consolidation to a single central site.

One site would be the existing, re-engineered B & J Dropbox Landfill in the north county. The other site would be located at the Potrero Hills Landfill in the central County.

The B & J Disposal site would continue to serve the Vacaville-Dixon area through the period of the Plan. Rio Vista would have options similar to the replacement sites alternative. With the anticipated closure of the Rio Vista Landfill in 2001, the wastes from this area could be exported to an out of County site, or be transported either to the B & J site or the Potrero Hills site.

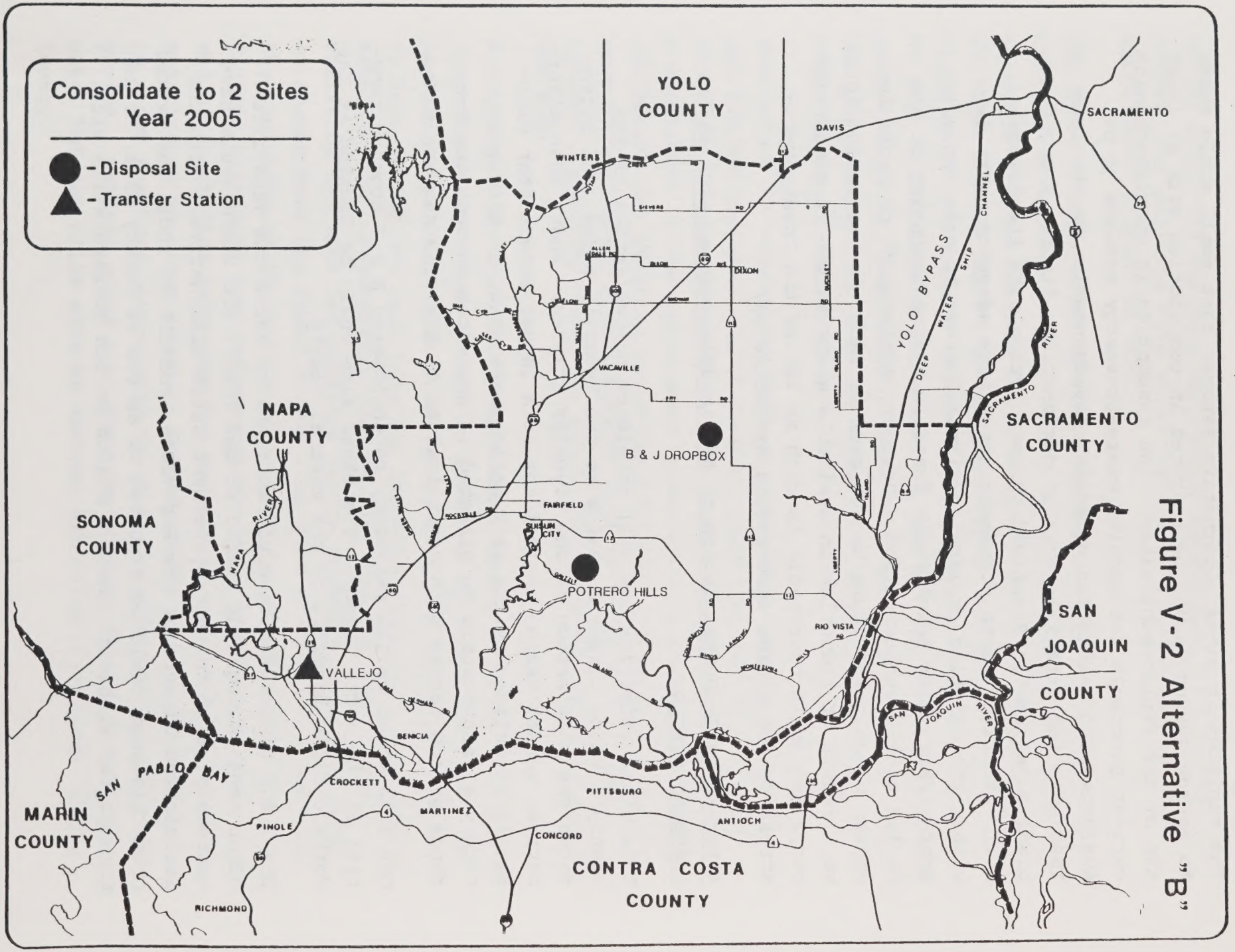


Figure V-2 Alternative "B"

The Fairfield-Suisun area would continue to dispose of its waste by direct haul to the Potrero Hills site. Wastes from the Vallejo area would be collected at a transfer station constructed in the Vallejo area prior to the anticipated closure in 1995 of the American Canyon site and hauled either to the Potrero Hills site or the B & J site for disposal. The Vallejo transfer station would be a large enclosed facility.

Upon closure of the Contra Costa Acme Fill (anticipated in 1989) Benicia would have the option of utilizing the Vallejo transfer station, for disposal at the Potrero Hills site or the B & J site or continued export to Contra Costa, to the replacement for Acme Fill.

The consolidation to two sites alternative also assumes that waste to energy resource recovery would occur in conjunction with the two consolidated disposal sites. Energy plants could be located either at the sites or at the transfer stations. However, the Central County Potrero Hills site would likely utilize a site in an industrial area of Fairfield or Suisun City because of limitations on locating an energy plant on site by the Suisun Marsh Protection Program.

EVALUATION OF ALTERNATIVES BASED ON ISSUES AND CRITERIA

Economic Evaluation

An economic comparison of alternatives is summarized in Table V-1. The table reflects each alternative's annual costs totaled for all of the Planning areas in each of the planning periods. Total cost per ton for each planning area (including transfer and energy facility costs) were multiplied by annual tonnage of estimated refuse load in the planning areas to derive annual costs. Table V-1 reflects sum total costs for all planning areas in respective planning years. The methodology to calculate costs is the same as that developed and utilized in the 1978 plan to calculate costs.

TABLE V-I
COST SUMMARY FOR ALTERNATIVE PLANS

TOTAL ANNUAL COST OF ALTERNATIVE PLANS, MILLION DOLLARS[a]

YEAR	ALTERNATIVE "A" (REPLACEMENT OF SITES)	ALTERNATIVE "B" (CONSOLIDATION OF TWO SITES)
	Replacement Sites Only	Consolidate to two sites, one transfer station
1987	25.9	30.5
1992	31.2	35.8
1997	36.6	41.2
2005	44.5	49.1

[a] All costs are shown in current 1982 dollars.

odhtabVI

The costs of various alternatives are evaluated by determining price base, construction cost, annual costs and rated capacity. Variables affecting cost of alternatives include transportation, collection, disposal, transfer stations and energy recovery facilities. Assumptions made in determining costs include applicability of consumer price index, construction costs index, and updated capital interest rates. Estimated land costs are based on Assessor's data and typical appraised land values. Transportation, collection and disposal costs are developed from average of County-wide estimates based on Survey of Collection and disposal operators. These are shown on Table V-2. These figures updated from a 1984 survey of collection and disposal operators are used only to prepare cost factors for facility cost comparisons. While they approximate actual costs, they should not be taken as actual costs in a specific geographic area.

The cost for a transfer station facility is based on a facility consisting of an enclosed structure designed for the Vallejo area occupying five acres of land and including the cost of tractors and trailers initially required.

The methodology for determining the estimated cost of a transfer station facility is the same as that used in the 1978 and 1984 plan. Capital costs estimated at $7.4 million, including stationary facilities and mobile equipment, were updated to 1997 by construction cost and consumer price indexes and added to current average estimated land cost of five acres of industrial land in the Fairfield or Vallejo area (based on recent sales data and appraisals of the County Assessor), to determine total capital costs.

Annual costs were calculated for the facility by updating labor, operation and maintenance, fuel and supplies, administrative and overhead costs. Updated capital amortization was calculated at 12% for 25 years for stationary facilities, 12% for 7 years for mobile, and also land (interest only) at 12%. Total estimated annual costs (O & M plus amortization) for a transfer facility of

TABLE V-2 SOLID WASTE COLLECTION-DISPOSAL COSTS-per ton, 1987

City	Collection Transportation	Disposal	Total
Benicia	$ a.	$ a.	$ a.
Vallejo	58.65	19.85	78.50
Fairfield Suisun	60.95	17.85	78.80
Vacaville Dixon	61.25	19.00	80.25
Rio Vista	67.70	21.30	89.00
Average Cost Countywide	$61.80	$19.85	$81.65

a. not available

the type required in the alternatives was determined to be $4,600,000.

Using an estimated refuse load of 400 tons per day for the planning area at the time required, (about 1997) the estimated per ton cost was determined to be $31.20 per ton (based on 4.6 million in annual cost divided by estimated tons per day). Costs were adjusted on the difference in refuse load in the year 2005 to compare economic feasibility. As waste quantities increase to about 500 tons per day in 2005, per ton cost lowers to about 27.75 per ton.

Estimated costs for an energy recovery facility were also based on methodology similar to that utilized in the 1984 plan, using the current estimated cost of a modular waste to energy system in the 30-45 million dollar price range, capable of handling 300 tons per day of refuse.

Total estimated annual costs (O & M plus amortization) for such a facility was calculated to range between $7.2 and 8.8 million. Revenue potential from energy production was estimated to range between $1.3 and $1.6 million. Estimated annual costs of $5.9 to 7.2 million less revenue, when divided by the estimated refuse load of the planning areas served by the facility in 1987 shows a per ton cost of about $59.00. Because of the high per ton net cost of energy production, this option was not costed out for other planning periods.

As might be expected, Alternative A Continue Existing Disposal Patterns, is the lowest cost in 1987, 1992, 1997 and 2005. In regard to alternative costs overall, it should be understood that the extra facilities, equipment and mileage entailed in the consolidation alternative (B) with transfer stations and long distance haul are more expensive per ton than alternative (A). This cost spread will increase with time. Disposal sites can be amortized over many years. Transfer stations and related facilities will incur years of cost escalation, and have added haul costs.

Evaluation of Other Criteria

The least cost plan, (Alternative A) does not necessarily represent the best solid waste management plan for the County. Alternatives must be weighed against the other criteria such as environmental factors, institutional structures and public acceptance. A discussion of these criteria follows:

Environmental Factors

Environmental ranking reflects a composite of many environmental criteria and factors. There are direct effects on use and quality of land, water and air. As well, there are secondary effects, particularly to resource conservation including such things as recycling and energy production. Consideration must be given to aesthetic factors such as sight and smell, unsightliness, remoteness from urban areas, use of land on closure of landfill, etc. Another factor is safety, equipment operation, and traffic hazard from waste hauling and roadway travel.

Public Health criteria consider the potential to reduce contact between man and solid waste, i.e. less sites (consolidated wastes), tend to present less health risk than numerous sites (replacement). In terms of direct physical effects to land, air, and water, it may be concluded that Alternative B (consolidation to two sites) should be rated as having less effect because only two locations are involved, (existing sites). Alternative A. (continue existing pattern) encourages the development of two new sites in previously undeveloped areas, and generally promotes the increase of physical impacts which could potentially be viewed as cumulative in nature. This impact is mitigated by the fact that neither of the replacements would be sited in Solano County but rather in Napa and Contra Costa Counties.

The implementation of the energy recovery process and facilities with any of the alternatives, besides providing important beneficial effects (considered under other criteria), would potentially create adverse effects associated with the industrial character

of the process. Alternatives A and B could potentially have two energy plants associated with two disposal sites.

It should be noted, however, that primary effects to land, air and water of all alternatives would be mitigated to reduced their significance, or the facility proposed by the Alternative would not be approved at the location proposed. It is recognized that the consolidated alternative has additional primary effects such as increased safety hazards due to increased haul, more fuel use, more air emissions and more exposure to wastes by rehandling during transfer steps.

Also, because primary effects can be expected to be fully mitigated for both alternatives, the relative value of this consideration is reduced in comparison to other criteria. In relation to land use, alternative A which emphasizes replacement of sites, including two new sites, is the most land consumptive. Alternative B would not require new landfills but would require a transfer station. Although the new sites will be located in Contra Costa and Napa, they will require considerable land area, and will impose a different use on lands now principally used for grazing. A potential secondary effect of the change in land use is the establishment of large scale non-agricultural use such as an energy recovery facility on open space lands. This might introduce a possible stimulus for nearby location of energy users and a concomitant escalation of land values.

Transfer stations, proposed under alternative B (one transfer station), would introduce a new industrial type use to their areas, but proper mitigation and design against nuisance would not likely create adverse land use conflicts.

In regard to traffic and safety criteria, alternative A is ranked highest because of the shorter haul distances associated with the replacement sites alternative. The present collection/disposal system within planning areas would not change substantially. In addition to longer haul distances, Alternative B would increase respectively the amount of equipment and handling of wastes, as

well as road travel and energy use (fuel). The latter alternative could potentially increase dangerous equipment operation, operator safety problems, road way traffic hazard, congestion and added safety risks (with increased occupational hazard exposure) through increased handling and transfer of wastes.

Generally, health considerations favor alternative B. Plans that minimize contact of man and solid waste are weighted over those that do not. The operation of two or more sanitary landfills (as with replacement sites, alternative A), theoretically increases potential for disease vectors, water contamination, etc., and generally presents a greater potential public health problem than operation of fewer landfills. However, the somewhat speculative definition of such impacts makes distinction between alternatives difficult on the basis of these issues. When potential offsetting impacts are accounted, the alternatives may be more equally balanced. In regard to aesthetic factors such as sight and smell and remoteness from urban areas, Alternative A is favored. Although the number of sites would be increased, the locations will be in other jurisdictions and tend to be remote and have certain aesthetic advantages over consolidation if it were to occur at an existing site.

Another criterion considered under the environmental factors is that of public acceptance of sanitary landfills and their perceived environmental effects, particularly on their desirability and effect on "quality of life" in relation to proximity to the public and to living areas. Some adverse response is to be expected from disposal sites, transfer stations, and energy recovery facilities. Garbage carries a social stigma that affects people's sensibilities. Few people care to live or work in close proximity to refuse disposal facilities.

Of the various alternatives, continuation of existing disposal patterns (Alternative A) would appear to minimize "quality of life" effects by location of sites for from urbanized areas and because it maintains well-established disposal patterns. Under

the other alternatives, the presence of regional transfer stations could adversely affect surrounding lands by reducing their perceived desirability as working or living areas.

One environmental factor not directly accounted for in this evaluation is the mitigation that replacement site proposals will provide to alleviate environmental problems connected with the location of existing sites. Both Acme in Contra Costa and American Canyon in Napa are located adjacent to wetland areas. Relocation to upland sites will reduce the potential for environmental conflict with these resources.

Institutional Factors

Institutional factors represent a significant consideration in the evaluation of alternatives. As used here institutions refer to the organizational structure which delivers garbage collection/disposal services to the community. This organizational structure plays an important role in defining the acceptability and feasibility of implementing alternatives and the facilities proposed.

In Solano County the private sector provides the institutional mechanism for managing the collection and disposal of the County's solid waste. Presently, there are six privately owned solid waste collection firms which have been franchised to provide collection service in designated areas. Collection service area boundaries are designated Countywide and provide for mandatory collection. The eight disposal sites serving the County are also privately owned (with the exception of Mare Island and Rio Vista) and have agreements affiliating them with collectors.

These institutional arrangements, particularly as they relate to the cities (which have approximately 94% of the County population, and hence responsibility for an approximate equivalent generated amount of the total waste stream) present institutional factors which work in favor of alternatives which continue the existing collection/disposal pattern which work against those alternatives to consolidate wastes from the cities. For example:

the consolidation of Fairfield and Suisun wastes with those of Vacaville and Dixon is effectively prohibited because the cities are served by two different collection firms (under separate agreements) with competing business interests. The same situation exists with the firm serving Vallejo; this company is affiliated with the franchise service Vacaville and Dixon. The existing contracted agreements for designated collection areas and disposal sites make it difficult for the separate entities to work toward establishing a common disposal facility.

These problems are compounded by the cautious perspective that cities have of one and another and the County, of losing control of guaranteed sub-regional disposal site capacity which might be replaced by the necessity to work together for a consolidated facility. Given the assurance of adequate and economical disposal capacity under present arrangements, cities are reluctant to alter the system knowing the potential problems associated with uncertain availability of disposal and loss of control over costs.

In view of these institutional constraints, Alternative A is ranked higher, in consideration of ease of continuing the present solid waste disposal system and the difficulty in changing the existing pattern.

Lengthened site lives also work against the concept of regionalization, combining service area waste streams in order to promote more effective operations, lower unit costs and improved reliability. The 1978 Solid Waste Plan foresaw the opportunity to promote regionalization of the County's disposal system with consolidation of disposal, first to two sites, then to a single central site. The opportunity to consolidate was based on the time when institutional constraints then in effect would be offset by the more immediate need to locate adequate disposal site capacity.

With the change in status of anticipated lifetimes and capacities of sites which have occurred since 1984, the opportunity for

regionalization through consolidation of disposal sites is no longer practical, and for the most part is precluded by continuation of the existing institutional arrangement until the late 1990's when circumstances could arise similar to those foreseen at an earlier date by the 1978 plan.

Recovery Goals

In regard to the criterion which measures the capability of various alternatives in promoting resource recovery goals, the alternative favoring consolidation should be ranked higher than the continuation of existing disposal pattern alternative. Principally, this reflects the idea that consolidation alternatives would be implemented at a later date. As noted in the Resource Recovery element of this plan, energy recovery is not likely to be practical until the medium and long-term planning periods when volumes are adequate to support operation of the system. This is expected to be true for all alternatives. The criterion also considers that transfer stations associated with the consolidation alternative would be located near urban areas and facilitate recycling activities due to accessibility and number of locations that could enhance participation, and ease of management of recycling programs at the facilities.

RECOMMENDATION

This chapter has reviewed issues which affect the development and consideration of alternatives discussed the advantages and disadvantages of the alternatives that have been developed, and then selects that alternative that appears to be the most advantageous as the recommended plan. As outlined below, the recommended plan selects Alternative "A", continuation of existing disposal patterns the preferred policy for solid waste management in Solano County. The basis for section of the replacement sites alternative can be summarized as follows:

1. The recommended plan (for continuation of existing patters) involves lower capital costs and is the least cost plan.

2. The recommended plan utilized existing institutional structures and presents no serious institutional constraints to feasible implementation because it uses the existing collection/disposal system and either contains wastes within the various community jurisdictions and planning areas in which they are produced or maintains long established disposal arrangements in other communities.

3. The recommended plan provides several operational advantages including shortest haul distances fewest changes in the existing collection/disposal system, less roadway travel equipment operation and waste handling (hence increased safety, lower traffic congestion and hazard) and less fuel use.

4. Constraints on site lives have been removed by re-engineering of the B & J site, the establishment of the Potrero Hills Landfill, shifts in disposal patterns and improvements in site operations.

5. The chosen plan provides the opportunity to replace existing environmentally constrained sites with replacements which have the capacity to serve the county's waste disposal needs well beyond the long term planning period.

6. There are no significant environmental disadvantages which limit implementation of the replacement alternative.

7. The recommended plan provides advantages for social acceptability and aesthetic concerns of facilities location, including establishment of sites away from population pressures, conflicting land use, and public visibility, while maintaining existing service areas and avoiding requirement of large scale transfer facilities.

8. The recommend plan provides an advantage for establishing waste to energy resource recovery by avoiding institutional constraints of public sector siting and implementation and encouraging private development of economically feasible waste to energy plants.

Facilities Plan Summary

1. The Solid Waste Management Plan should encompass utilization of existing sites, with transition towards replacement by environmentally superior, long term sub-regional disposal sites.

2. If environmentally superior replacement sites for Acme and American Canyon are not approved in the short or medium term planning periods, the County will need to reevaluate the existing disposal patterns to determine the feasibility of implementing one of the consolidation options.

3. Approval of replacement sites should strongly encourage participation by the operators in resource recovery. Pilot waste to energy projects presently proposed in conjunction with the B & J Disposal site and Solano Garbage Company should be encouraged.

4. If an energy recovery facility is not operational in the County prior to 1997, a re-evaluation and assessment of operational energy recovery systems should be made at the beginning of the long term period of the plan, and a program devised to further encourage energy recovery.

5. The County and its cities may consider the importation of wastes from out of County on a case by case basis, and encourage it where it is environmentally and economically beneficial to do so and where consistent with existing policies and limitations affecting waste import.

VI. SOLID WASTE FACILITIES PLAN

This section provides a revision and update of the Recommended Plan for Solid Waste Disposal. Re-evaluation of existing circumstances as detailed in other sections of this Solid Waste Management Plan Update have shown that few changes in the structure and conditions of the County's solid waste system have occurred since adoption of the 1984 plan update.

Data from the annual State Department of Finance estimates show that the County population expanded at about the same rate has been projected by the revision plan. However, a recent survey of disposal site operators indicates that the pounds per capita of wastes generated is higher than projected (average for total County area is 5.4 lbs./capita/day, previously estimated about 3.7 lbs./capita/day for 1984.) After considering these two factors, the overall increase in municipal wastes disposed in 1987 is slightly greater than projected from factors in the 1984 plan. Although actual increases in wastes to be disposed are greater than previously projected, the projected wastes are not sufficient to significantly reduce the time periods anticipated by the 1984 plan for disposal sites to reach capacity and close.

Two other events which may alter the structure of the solid waste system are requirements to find replacement sites for Benicia and Vallejo. The American Canyon Upland site is proposed to be developed by Tri-County Development Co. as a replacement for the American Canyon Landfill in Napa County and Contra Costa County is actively seeking a replacement for Acme Fill which serves Benicia. A failure in the effort to establish these replacements will require Solano County to seek alternatives for the disposal of Vallejo and Benicia wastes.

A revised description of the recommended Solid Waste Facilities Plan is provided below by planning period. The dates depicting the planning periods have been revised to reflect the present situation. The previous short term planning period, 1982-1985 is now identified as 1988-1992. The medium term, previously 1986-

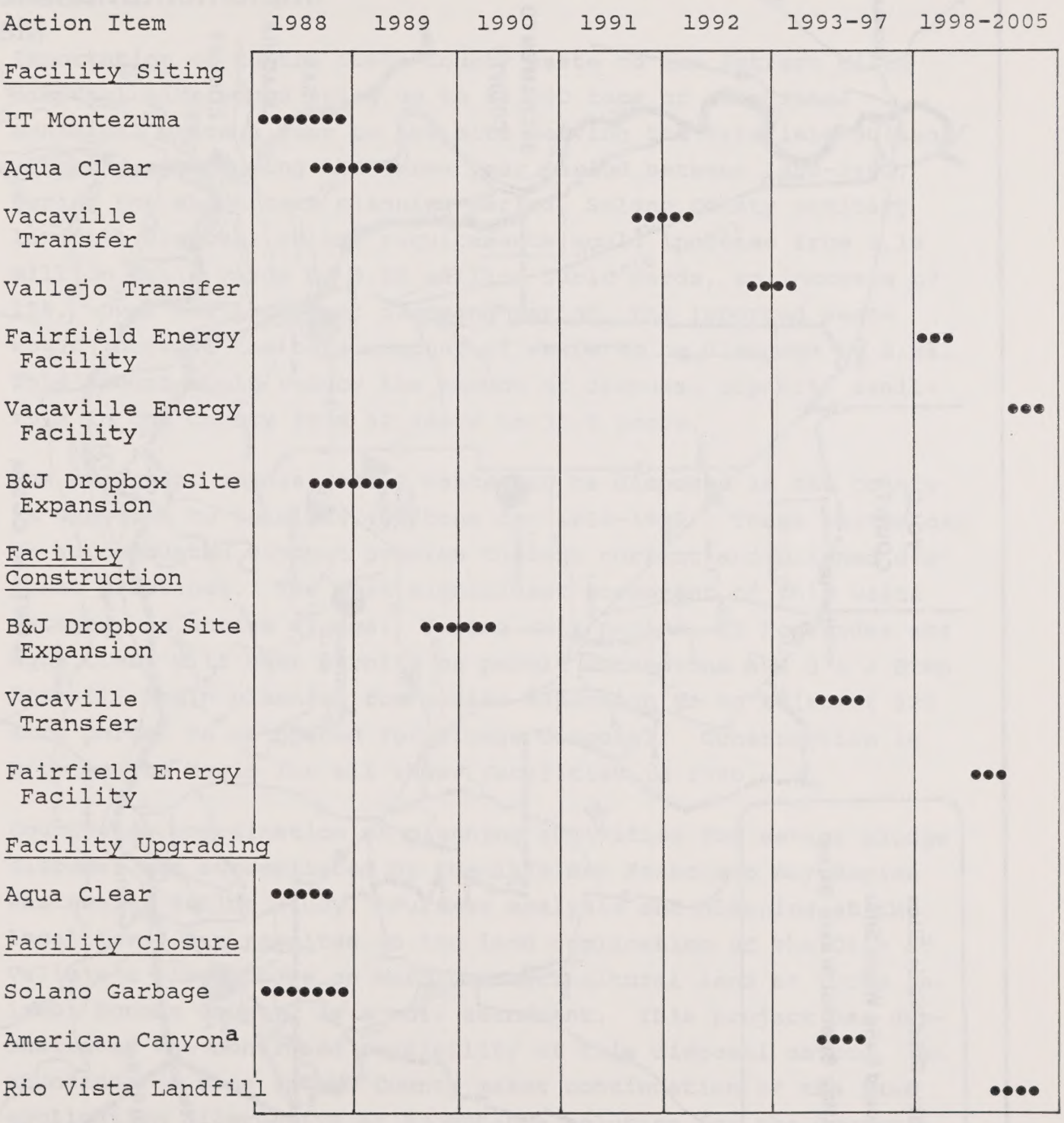
1990 is now 1993-1997 and the long term 1991-2000 is now 1998-2005. Figure VI-1 shows the implementation schedule for facilities, and Figure VI-II shows facility location.

Short Term Plan

The recommended plan for the period 1988-1992 is basically to continue the current practices in regard to storing, collecting, hauling, and disposing of solid wastes generated. The collection-disposal system will remain essentially the same as the existing system with the following possible exceptions: During the short term planning period, processing of permits for the American Canyon and Acme Fill replacement sites is expected to take place in Napa and Contra Costa Counties respectively. If sites are successful in obtaining permits, construction activities could be undertaken and disposal could begin at the end of the short term or beginning of the medium term planning periods. In the interim, Vallejo wastes will continue to be disposed at the existing American Canyon Site in Napa which has sufficient capacity to serve until 1995-97. Benicia wastes will be disposed at Acme until 1989 when that site is projected to close. Then they will be hauled to the Acme Transfer Station for transport to the site chosen as the destination for Contra Costa County wastes. As one site option, Contra Costa has applied to Alameda County for use of the Altamont landfill for waste now being sent to Acme fill. Both Contra Costa and Alameda County's Solid Waste Plan may need to be amended and negotiations conducted between the City of Benicia and Alameda County as well as Contra Costa in order to dispose of Benicia's waste at Altamont, or at a new site in Contra Costa. If a replacement is not made available for disposal of Benicia wastes in Contra Costa County, it will be necessary to explore options for disposal of Benicia wastes in Solano. This will need to take place in 1989 prior to the end of Benicia's current contract with Bayshore Disposal in 1991. Disposal of Benicia wastes at one of three Solano County sites is deemed to be consistent with this Plan. The amount of municipal and non-processing industrial waste to be disposed of in Solano County is anticipated to total approximately 1,649,000 tons of

FIGURE VI-1

FACILITIES ELEMENT IMPLEMENTATION



[a]If no replacment site established

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Figure VI-2 Waste Disposal Facility Implementation Plan Map

waste over the short term period 1988-1992. The existing disposal sites can continue to accommodate this amount of solid waste.

Importation of Contra Costa County waste to the Potrero Hills disposal site would bring up to 88,500 tons of additional municipal waste a year to the site serving the Fairfield-Suisun planning area during the three year period between 1989-1992. During the short term planning period, Solano County sanitary landfill disposal volume requirements would increase from 3.16 million cubic yards to 3.55 million cubic yards, an increase of 12%. Over the long-term planning period, the imported waste would increase the total amount of waste to be disposed by 2.8%. This amount would reduce the amount of disposal capacity available in the County from 32 years to 31.5 years.

The amount of special solid wastes to be disposed in the County is expected to total 84,400 tons for 1988-1992. These wastes can be accommodated without problem through current and planned disposal practices. The most significant component of this waste category is sewage sludge. During this period, IT Montezuma and Aqua Clear will seek permits or permit extensions and B & J Drop Box will begin planning for a site expansion to an adjacent 320 acre parcel to be opened for sludge disposal. Construction is proposed to begin for all these facilities in 1990.

Countywide coordination of planning activities for sewage sludge disposal was accomplished by the 1979 San Francisco Bay Region Wastewater Solids Study. Further analysis and planning at the local level has resulted in the land application of the City of Vallejo's lime sludge on marginal agricultural land at Tubbs Island, Sonoma County, as a soil amendment. This project has demonstrated the continued feasibility of this disposal method. An abundance of area in the County makes continuation of the land application alternative an acceptable solution for the County's sewage sludge disposal needs. The Fairfield-Suisun Sewer District has established a demonstration project using wastewater

(brewery waste) on adjacent lawn turf nursery crops, and has explored the feasibility of sludge application. Sewage sludge from all other sources in the County are stored on the property of the respective sanitation plant sites and disposed of in landfills. Long term capacity exists for sewage sludge disposal.

Disposal of drilling mud is expected to total 835,500 barrels over the period 1987-1992. If present quantities of drilling mud continue to be generated and present disposal patterns continue, Aqua Clear farms may close at the beginning of the short term, (before 1989). There is capability for additional capacity at the Aqua Clear Farms site. However, continued operation of the site requires County and State approval. If the site is not permitted before 1989 to continue or to expand operation, then a replacement site out of County will be needed. Of the five sites currently operating in the Central and Northern California area, the Kettleman site in Kings County provides the most feasible long term potential as a replacement for disposal of the County's drilling mud waste at the Aqua Clear Farm site. A replacement site for drilling mud in Solano County is feasible towards the end of the short term (1989-1990). One of the existing County disposal sites which meets geologic and other site requirements could modify the site to establish dewatering/treatment or surface impoundment facilities for drilling mud and co-dispose of dewatered sludges with other wastes in the landfill. County and State approvals for necessary permits and conformance with County waste importation policies would be required. Potrero Hills Landfill is considering an application to amend its permits to accept drilling muds.

Food processing waste in the County consists principally of liquid tomato waste. The food processing waste stream has not increased significantly in the last five years, and is not expected to have an appreciable effect on the overall solid waste handling in the County. These wastes are disposed of by land application on marginal agricultural lands by spreading, discing, and irrigation methods. Periodic monitoring of the waste stream is conducted to ensure adequate disposal.

Other special solid wastes such as asbestos, medical waste, household hazardous wastes, and auto bodies and tires are not expected to have a significant impact on collection or disposal of solid waste in the County.

A significant aspect of the revised plan is to promote expansion of resource recovery activities and practices. These efforts are spelled out in the Resource Recovery Element (Chapter IV).

Medium Term Plan

During the medium term (1992-1997) planning period, it is anticipated that wastes will continue to be disposed of in the existing planning areas. Vacaville and Dixon will continue to dispose of municipal wastes at the B & J Landfill on Hay Road near State Route 113. Fairfield and Suisun will utilize the Potrero Hills site off SR-12. Vallejo will begin to dispose of its wastes at the American Canyon replacement in Napa County. The existing American Canyon site will not have sufficient capacity to continue to absorb Vallejo and Napa wastes during the entire medium term if the replacement does not come into operation. If this occurs, a transfer station will be established in Vallejo and wastes transported to either Potrero Hills or B & J Drop Box and the existing American Canyon site will reach capacity and close. Rio Vista will utilize its existing municipal site on Airport Road. Benicia will continue to export its wastes to Acme Fill replacement in Contra Costa County. If an Acme replacement is not established in the short term, Benicia will have the option of hauling to the American Canyon Replacement, Potrero Hills or B & J Dropbox. A study of alternatives available to Benicia will be undertaken in 1989 during the short term planning period. Any of these options will be consistent with this Plan.

The amount of municipal and non-processing industrial waste to be disposed is anticipated to total approximately 1,958,100 tons over the medium term period. This represents an increase of about 19% from the short term, and it is expected that existing

in County disposal sites can continue to accommodate the wastes generated.

Sewage sludge from the County's treatment plants is expected to increase during the medium term approximately 13%. Sludge wastes represent resource recovery potential, but other than the possibility of the City of Fairfield's proposed demonstration project and continued land application of sludge, it is not expected that economically feasible recovery processes can be achieved over the medium term. Increased volumes of sludge will require continued disposal in sanitary landfills.

Other special solid wastes such as food processing wastes are not expected to impact the solid waste program over the medium term and no problems with disposal are anticipated.

Activities and plans formulated in the short term planning period should provide the impetus toward increased material recovery. Quantities of waste and market demand for salvaged materials in the medium term should be sufficiently large to facilitate various potential recycling activities. Potentially, curbside collection service operated by designated collectors could be established throughout the County by the end of the medium term period.

An energy recovery system may become feasible during the medium term planning period in the Fairfield-Suisun area. However, the large capital cost of implementing a system and uncertainty of revenues from energy sales prohibits construction.

Long Term Plan

The long term plan covers the period from 1998-2005. If replacement sites for American Canyon and Acme Fill come into operation as planned, the disposal pattern established in the short term will continue to serve the vast majority of County residents well beyond the long term period. Sufficient capacity will also be available if Benicia and Vallejo are forced to seek in County sites for future disposal.

In the long term period, the Rio Vista Municipal Landfill will reach capacity. Rio Vista will be faced with choosing an out of County site, B & J Landfill or possibly Potrero Hills. Depending upon the destination of the wastes, the city may also wish to consider utilization of either a transfer facility or replacement disposal site to reduce haul costs.

Special solid wastes, including sewage sludge and food processing wastes, are expected to increase through the long term period. Aside from the feasibility of continued or expanded resource recovery, it is assumed that the wastes generated will be disposed by means other than landfill, as is presently done.

It may be feasible to introduce a resource recovery system incorporating both materials and energy recovery during the long term planning period. Candidate collection areas beside Fairfield-Suisun include Vallejo and Vacaville-Dixon. Waste streams and energy prices should be monitored during each plan update to determine when a threshold will be reached to support the development of an energy recovery facility.

VII. PLAN IMPLEMENTATION

This section describes the mechanism necessary to implement provisions of the Solid Waste Management Plan. It evaluates the existing institutional and funding structures which support the present plan. It provides an update of the costs necessary to implement the plan, updates the enforcement program and assigns responsibilities for implementing the revised plan. Finally, it outlines policy toward the importation of municipal wastes.

Existing Solid Waste System

Private industry serves all of the six solid waste collection and disposal planning areas. Private collectors operating in the incorporated areas are governed by franchises and local collection ordinances. All collectors transporting wastes in Solano County must secure permits from the County Environmental Health Services Division.

Private industry also manages all of the County's disposal sites although two sites, Mare Island and Rio Vista, are owned by public entities. All disposal site operators must also obtain permits from the Division of Environmental Health Services.

In Solano County, the cost for collecting, transporting and disposing of a ton of solid waste averages $81.29. Based upon per ton estimates by the collectors, average cost countywide for collection and transportation is $61.81 and disposal averages $19.48.

Collection disposal costs will vary considerably according to the area served. Labor costs, terrain, number of customers, size of equipment and its age, and the level of services the collector may provide to the city are among the many factors which affect the operator's expenses.

Revenues to pay for the collection-disposal system are derived chiefly from monthly service charges assessed to the residents, and commercial customers. The current residential charges are

shown in Table VIII-1. As with collection-disposal costs, the service charges do not provide a direct comparison of costs for services received. The charges vary notably from city to city. Differences in charges per can and thus service charge payments are explained by differences in the operating costs and the quality and quantity of service provided by the collector. For example, Benicia charges appear relatively high, but those charges include street sweeping, a task normally undertaken by city crews. Differences also occur between curbside and backyard collection.

In addition to service charges to residents for waste pickup, there are other costs of disposing of the community's wastes. Residents indirectly pay for the Solid Waste Management System through property taxes. Street sweeping and leaf removal programs are operated in most areas using city crews and equipment. Litter cleanup and park and public lands maintenance programs are operated in other communities.

Table VIII-2 shows the collectors and disposal sites of the existing Solid Waste Management System. The short term plan proposes no new facilities or collection methods to supplement or change this existing system.

The two special solid waste disposal sites operated quite differently from the municipal waste sites. The Aqua Clear Farms drilling mud disposal site is operated as an individual facility which accepts drilling mud loads from a variety of collectors. The firm does not operate its own collection vehicles. The costs of operating the drilling mud collection and disposal system are borne by the users of the system. The I.T. Montezuma site is part of an integrated system operated by the I.T. Corporation which collects and transports wastes in company owned vehicles principally and disposes of them in company owned sites. County costs for regulating the special waste sites are reimbursed by annual site inspection fees.

TABLE VII-1 Monthly Service Charges for Residential Solid Waste Collection and Disposal

Service Area	1 Can	2 Can	Unlimited	Annual Service Charges for 1 Can or Unlimited Collection
Benicia	$9.70	$14.70		$116.40[a]
Vallejo			$8.20	98.40
N & L	8.20	15.70		98.40
Fairfield			7.05	84.60
Suisun City			7.05	84.60
Serv. U. Sanitary	8.35	12.25		100.20
Vacaville			8.50	102.00
Dixon			7.00	84.00
Rio Vista	8.00	9.50		96.00

[a]Includes street sweeping and collection from backyard

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TABLE VII -2 Existing and Proposed Solid Waste Flow, 1988-1992

Service Area	Collector	Disposal Site
Vallejo	N & L Garbage Service	American Canyon Landfill
	Vallejo Garbage Co.	American Canyon Landfill
(Mare Island)	Western State Disposal	Redwood Landfill
	U.S. Eagle, Inc.	Mare Island Landfill
Benicia	Bayshore Disposal	Acme Landfill
Fairfield-Suisun	Solano Garbage Co.	Potrero Hills Landfill
	Serv U Sanitary	Potrero Hills Landfill
(Travis AFB)	Reliable Garbage Service	Potrero Hills Landfill
	Western States Disposal	Yolo County Landfill & Redwood Landfill
Vacaville	Vacaville Sanitary Service	B & J Landfill
	California Medical Facility	B & J Landfill
Dixon	Dixon Sanitary Service	B & J Landfill
Rio Vista	Rio Vista Sanitary Service	Rio Vista Landfill

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Solid Waste Disposal After a Natural Disaster

Solid Waste Contingency Planning for labor disputes, equipment breakdown, fuel shortage and natural disasters are outlined in Appendix C.

Organization for Administration of the Plan

The County's present organization for solid waste management is under direction of the County Administrator with policy direction from the Board of Supervisors and staffing by the Departments of Environmental Management and Public Works. The Administrator prepares the budget and provides overall direction to staff. The Department of Environmental Management's Division of Environmental Health, as the designated Local Enforcement Agency, is responsible for inspection and enforcement of storage, collection and disposal practices and revisions to local solid waste ordinances. The County's enforcement plan program is contained in Appendix C. The Department of Environmental Management's Policy Planning Division maintains the plan, staffs the Resource Recovery Advisory Committee and provides planning liaison and public information on solid waste management matters. Public Works provides technical assistance on solid waste disposal site engineering.

Policy guidance to the Board of Supervisors on resource recovery is provided by a standing Resource Recovery Advisory Committee formed by the Board in 1985. For other solid waste management issues, committees have been formed on an ad hoc basis. During preparation of the County's 1978 waste plan, Policy, Citizen's and Technical Advisory Committees were all used to guide plan development. The current plan update utilizes a Technical Committee and a Citizens Review Group. A Litter Committee was formed in the last 1970s to coordinate the County's SB 650 countywide cleanup efforts, and in 1983 a Solid Waste Management commission with representation of the cities was created to coordinate negotiations surrounding the importation of the City of San Francisco municipal waste.

The existing administrative and policy making structure has served Solano County well over the past four years and it is proposed that the administrative structure be continued into the future. However, two events in 1983 suggest that in the policy making area the County and cities may wish to review the need for an advisory body of a more permanent nature.

Processing of the City of San Francisco's proposal to import its municipal waste to the B & J Landfill in 1983 pointed up the cumbersome nature of the waste plan amendment ratification process and the difficulty of identifying representatives of the cities capable of establishing the conditions under which importation might be accepted. Also in 1983, the state enacted a law which provides that the County Board of Supervisors can recover solid waste management planning costs from collectors within the cities. Increases in such assessments must be endorsed by the cities in which the collectors operate so that the cities have an increased responsibility and stake in the planning process. One option which would promote increased solid waste planning coordination between the County and the cities is the establishment of a policy advisory committee. This committee would make recommendations on issues of solid waste management policy to the city councils and the Board of Supervisors. Subjects which might be the purview of this committee include Solid Waste Management Plan amendments, negotiations with those wishing to import municipal wastes to the County and budgeting for planning expenditures. Depending upon the success of the Committee, its functions could eventually be expanded to a joint powers agency capable of amending the Solid Waste plan and developing solid waste to energy projects among other functions. The committee would be comprised of one representative from each of the city councils and two representatives of the Board of Supervisors. Staffing would be provided by the County and funding would be derived from the waste collectors through solid waste planning fees as provided for in State law. The feasibility of establishing a policy committee will be investigated during the short term planning period.

Proposals contained in this plan support the continued functioning of the Resource Recovery Committee. As described in the Resource Recovery Element, Chapter IV, this committee promotes and coordinates recycling programs, establishes informational programs, promotes markets for recyclables and monitors the progress in developing solid waste to energy projects. Membership includes the collectors, service groups, cities and the County and other interested parties appointed by the Board of Supervisors and the mayor's conference.

Plan Implementation Tasks

Table VIII-3 shows the proposed tasks, costs and assignments of Solid Waste Management Plan to be undertaken in the short term 1987 - 1992 planning period.

Short Term Costs of the Plan

Because the only requirements of the short term plan are administrative in nature ,the only costs are annual administrative costs. Short term administrative costs were shown in Table VIII-3. The variation in total annual costs is attributable largely to the one time expense of studies. A major planning effort will occur in 1991 when the County updates its Solid Waste Plan. Other one time costs will include determining the feasibility of a composting study and an inventory of recycling volumes.

Financing the Short Term Plan

Table VIII-4 projects revenues and expenditures necessary to fund the plan during the short term planning period. Costs are financed from three revenue sources: a direct inspection charge to vehicles and disposal sites, the county property tax and planning and administration fees assessed to solid waste collectors and disposal site operators. Table VIII-4 is not an actual forecast of revenues and expenses. Inflation will necessitate higher rates and charges as costs increase over the years.

TABLE VII -3
SOLANO COUNTY SOLID WASTE MANAGEMENT PLAN
PROPOSED TASKS, COSTS AND ASSIGNMENTS, 1988-1992

	1988	1989	1990	1991	1992	
Inspection and Enforcement:						
Inspect and Enforce Storage Practices	48,000	48,000	48,000	48,000	48,000	Environmental Health Services
Inspect and Enforce Collection Practices	3,900	3,900	3,900	3,900	3,900	Environmental Health Services
Inspect Collection Trucks	6,000	6,000	6,000	6,000	6,000	Environmental Health Services
Inspect and Enforce Disposal Practices	41,000	41,000	41,000	41,000	41,000	Environmental Health Services
Enforce Agricultural Waste Standards	1,100	1,100	1,100	1,100	1,100	Environmental Health Services
Total Inspection and Enforcement	100,000	100,000	100,000	100,000	100,000	
Planning and Administration						
Monitor Collection Permit System	1,000	1,000	1,000	1,000	1,000	Environmental Health Services
Monitor Disposal Permit System	600	600	600	600	600	Environmental Health Services
Monitor Efforts to Find Replacements for Disposal of Benicia Wastes	500	2,500				Environmental Management, Board of Supervisors, Cities and Collectors
Review and Update SWMP	6,000			35,000	5,000	Environmental Management
Review and Approve Site Closure			1,000			Environmental Management
Administer and Coordinate SWMP Budget and Tasks	3,500	3,500	3,500	3,500	3,500	Board of Supervisors, CAO, Environmental Management
Investigate Feasibility of Policy Committee		3,000				Board of Supervisors, Cities, Environmental Management
Staff Policy and Resource Recovery	15,000	15,000	15,000	15,000	15,000	Environmental Management
Total Planning and Administration Program	26,700	25,600	21,100	55,100	25,100	
Programs						
Reestablish White Office Paper Program in Co. Offices	1,000					Solano County
Prepare Feasibility Studies for Multi-material Curbside Recycling			5,000			Resource Recovery Committee Cities and Collectors
Continue Resource Recovery Public Information	1,000	1,000	1,000	1,000	1,000	Resource Recovery Committee
Prepare Composting Study		5,000				Resource Recovery Committee Cities and Collectors
Inventory of Recycling Volumes	2,000		2,000		2,000	Resource Recovery Committee
Total Programs	4,000	6,000	8,000	1,000	3,000	
Annual Costs	130,700	131,600	129,000	156,100	128,000	

TABLE VII -4 REVENUE EXPENSE PROJECTION 1987-88 TO 1991-92 (1987/DOLLARS)

Revenues	1987/88	1988/89	1989-90	1990-91	1991-1992
Collection Inspection Charges	$ 3,400	$ 3,400	$ 3,400	$ 3,400	$ 3,400
Disposal Inspection Charges	6,100	6,100	6,100	6,100	6,100
Planning & Administration Fees	30,720	30,720	30,720	30,720	30,720
Property Taxes	94,000	96,000	98,000	91,000	93,000
Total Revenues	$134,220	$136,220	$138,220	$131,220	$133,220
Expenses					
Inspect & Enforce Storage Practices	$48,000	$48,000	$48,000	$48,000	$48,000
Inspect & Enforce Collection Practices	10,000	10,000	10,000	10,000	10,000
Inspect & Enforce Disposal Practices	42,000	42,000	42,000	42,000	42,000
Planning & Administration	26,700	25,600	21,100	55,100	25,100
Programs	4,000	6,000	8,000	1,000	3,000
Total Expenses	$130,700	$131,600	$129,100	$156,100	$128,100

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Collectors will continue to pay an average of $56.00 per truck per year to cover inspection. Trucks used exclusively for recycling are excluded from inspection by current State enforcement regulations. Municipal waste disposal sites will pay $555.00 per year for inspections. The Mare Island site, I.T. Montezuma and the Aqua Clear Disposal site each pay $2,200. These charges are collected annually by the Division of Environmental Health in the form of operation permits.

At present, the County property tax is relied upon to finance a substantial portion of the enforcement program and to implement resource recovery programs. In the case of enforcement of disposal practices, the difference between revenue from fees and program costs is about $35,000. Enforcement costs can be more directly related to revenues if they are borne by the actual users of the system. An alternative way of paying these costs could be by imposing a per ton tipping fee at sites within the County. (B & J Drop Box, Potrero Hills and Rio Vista). This cost would be approximately $.30 per ton which would translate to approximately .05 on the monthly garbage bill. A similar but separate assessment could be used to fund programs such as Resource Recovery programs and household hazards collection days. Any such assessment needs to be tied directly to the monthly garbage bills so that the cost is borne directly by the user. In turn, collectors should be allowed to recover their costs without having to wait to renegotiate their franchises. Analysis of the feasibility of a direct cost pass through is a task which could be assigned to a policy advisory committee.

Planning and administration will be covered by assessing a fee to operators of solid waste facilities within the County. This financing mechanism is set forth in the Government Code Section 66784.3 which provides that the Board of Supervisors may levy reasonable and necessary fees to cover the costs incurred for the preparation, maintenance and administration of the plan. The fees are set by a resolution of the Board of Supervisors. Costs will be apportioned to each solid waste collector based upon the population in the collector's service area. The fee is collected

annually. Any future increase in such fees will require ratification by the cities.

Importation of Municipal Wastes to Solano County

In the 1984 update, the Solano County Solid Waste Management Plan was amended to adopt criteria by which to judge whether or not a proposal to import wastes is consistent with the waste management plan. This policy was adopted in response to a proposal to accommodate San Francisco Municipal Wastes at the B & J Drop Box site near Vacaville for a five year period 1988 - 1993. These criteria, outlined below, have been updated to reflect changes in the disposal system.

In 1984, the voters passed an initiative which limits to 95,000 tons per year the amount of solid waste which can be imported into Solano County. The ordinance has the effect of requiring any proposal to import solid waste, in excess of the 95,000 tons, be submitted to a vote of the electorate. Although the ordinance does not affect hazardous waste imports, the limitation does affect such non-municipal wastes as sewage sludges, ash, and other special wastes which may normally be disposed of in municipal landfills. The measure is interpreted to exclude from the 95,000 ton limitation the following special solid wastes which are not disposed by traditional landfill disposal methods: Drilling muds disposed of at special solid waste disposal sites and with prior approval of the Environmental Health Division, special solid wastes which are land farmed on areas other than active municipal landfills or which can be incorporated into daily landfill cover.

The ordinance passed by the voters is binding upon the County of Solano. Although it did not amend the Solid Waste Management Plan, it does place a practical limit upon the amount of wastes which can be imported. The full text of the ordinance is outlined in Appendix E.

Traditionally, municipal wastes have moved freely between Solano County and neighboring counties because disposal sites have been

located efficiently in relation to the collection areas they serve. The existing Solid Waste Plan recognizes this collection disposal pattern and provides for adequate capacity to continue the pattern over the short, medium and long term planning periods. Such planning cannot fully account for the impacts which can result from the transportation of large quantities of waste from an unforeseen source. For this reason, major changes in the disposal pattern must be evaluated with respect to their impact upon the County's ability to achieve plan objectives.

The Solano County Solid Waste Management Plan contains a number of general and specific objectives which seek to provide an efficient system of waste handling consistent with the community's aesthetic, socio-economic, legal and environmental quality goals. Among the objectives which may be relevant to import proposals are measures such as eliminating environmental degradation caused by solid waste, practicing resource recovery to the maximum degree economically feasible, optimizing the total number of land disposal sites and adhering to the highest operational standards at all land disposal sites.

Although a given proposal may be judged consistent with the Plan objectives, the impacts it will have upon the County must be considered. Large quantities of waste may be transported for great distances for disposal at sites in Solano County. These increased waste loads will reduce the life of facilities, impact roads, create aesthetic concerns and require greater local regulatory efforts for vector and odor control. Solano County is prepared to accept the increased loads so long as adequate mitigations are provided and sufficient compensation is made, including a per ton disposal fee to compensate for the increased disposal demands. This per ton disposal fee will be negotiated on a contract by contract basis. If such compensation is not forthcoming for any reason, then this element of the plan must be amended prior to issuance of any permit.

Solano County is fortunate to have an abundance of environmentally sound disposal sites which enable the County to accept the

wastes of others who have waste disposal problems which they have been unable to resolve. In saying this, it also should be recognized that disposal capacity is a finite resource which must be preserved for the benefit of local residents and that one geographic area cannot effectively solve the region's waste disposal problem. This problem must be solved through regional planning which seeks to achieve source reduction and resource recovery. The County can further these objectives by participating in such planning and by evaluating import proposals according to how well the generating community is achieving its recovery objectives.

It is not known to what extent proposals will be made to import significant quantities of waste in the future. However, it is clear from the 1983 proposal to import San Francisco waste that the amendment process is cumbersome and time consuming. Only those proposals which will have a significant impact upon the Solid Waste Management Plan should be subjected to the amendment procedure.

The Solid Waste Plan identifies sites which have been planned for importation provided the stated conditions are met. Identification in the plan is to be supported by a designation of waste sources in the use permit. The major sites which have been identified for waste import are Aqua Clear which accepts drilling muds and Potrero Hills which has been authorized to accept up to 88,500 tons a year from Contra Costa for a three year period. No other sites are currently identified for municipal waste import. Some special wastes might be imported to Potrero Hills or B and J Dropbox. B and J Dropbox was designated to accept San Francisco wastes for a five year period 1988-1993; however, the contract governing that proposal has been abandoned.

Additional policy is necessary to achieve conformity between the 95,000 annual import limitation imposed by the voters and the provisions of the Solid Waste Plan which allow a site to import up to 10% of its annual disposal tonnage without triggering a plan amendment. It is the intent of this plan that each disposal

site which has not ceased operation for a continuous period of six months be allowed to import up to 10% of its 1987 total solid waste tonnage receipts from Table III-5 shown as follows: Potrero Hills, 10,750, B&J Dropbox, 5,840 and Rio Vista, 550. These annual import tonnages shall be reserved for the use of each site. In no case shall the total amount of imports to all sites be allowed to exceed the 95,000 ton limitation imposed by the voters.

In order to ensure compliance with the import limit, the County Department of Environmental Management will monitor the importation of waste by requiring quarterly reports from site operators indicating by county of origin, the source and amount of waste disposed. In addition the Department will maintain a list of authorizations granted which entitle the holder to dispose of imported waste. This list will provide the basis for determining whether there remains any unallocated right to import which may be granted to future permit applicants.

Each request to import into the County any solid waste defined pursuant to Section 3 of the Import Ordinance (Appendix E) shall contain at least the following information:

- Origin/Source of the Waste
- Name of receiving solid waste disposal facility
- Amount of waste (in tons) to be disposed in Solano County (average daily amount, average annual amount, total amount over the term of any applicable agreement related to waste)
- Physical and chemical characteristics of the waste stream.

If a proposal is received to import wastes to an existing or future disposal site which has not been identified for the disposal of such wastes, the proposal will be deemed to be in conformity with the plan if the applicant can demonstrate the following:

- The proposed waste stream will not increase by more than 10% the 1987 annual tonnage disposed at the site as shown in the Solid Waste Plan and that the proposal would not exceed the 95,000 ton importation limit.

- No hazardous wastes will be included in the wastes to be disposed

- An adequate circulation system exists to accommodate the increased waste loads

- Transport or disposal of the additional wastes will result in no increase in offsite litter

If any of the above conditions cannot be met, an amendment to the Solid Waste Management Plan will be necessary.

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APPENDIX A **Present Salvage Resource Recovery Practices in Solano County**

Type of Material	Source	Amount per year in tons
Cardboard	Solano Garbage Company	166
	Anheuser Bush	1,200
	Lucky Distribution Center	260
	Vacaville/Dixon Sanitary & B & J Landfill	1,000
	Vallejo Garbage	468
	M & M Recycling	1,392
	Vacaville Recycling Center	11
	Other Commercial	4,474
	Subtotal	8,971
White Office Paper & Computer Paper	City of Vallejo	3
	M & M Recycling	204
	Other Commercial	445
	Travis Air Force Base	39
	Subtotal	691
Newsprint	Vacaville Recycling Center	222
	VALCORE	147
	M & M Recycling	576
	Vacaville/Dixon Sanitary & B & J Landfill	300
	Human Services Fund	96
	Wheeler Enterprises	400+
	Vallejo Garbage	480
	Subtotal	2,221
Glass	Human Services Fund	24
	VALCORE	50
	Vacaville Recycling Center	30
	Vallejo Garbage	240

	Solano Garbage Company	46
	Vacaville/Dixon Sanitary & B & J Landfill	N/A
	Atlas Metal & Iron *	475
	Anheuser-Busch	2,300
	Other Commercial	575
	Subtotal	3,740
Metal (ferrous & nonferrous)	Atlas Metal & Iron *	2,000+
	Travis Air Force Base	914
	Other Commercial	488
	Subtotal	3,402
Aluminum	Atlas Metal & Iron *	1,680
	Vacaville/Dixon Sanitary & B & J Landfill	40
	Vacaville Recycling Center	4
	VALCORE	3.9
	Human Services Fund	1.2
	Vallejo Garbage	21
	Travis Air Force Base	103
	Anheuser Busch	115
	American National Can	3,900
	Other Commercial	23
	Subtotal	5,891.1
Wood Waste	Tree Trimming & other Commercial	3,659
	Subtotal	3,659
Oil	Commercial	354
	Solano Garbage	12.4
	Vallejo Garbage	7.4
	Subtotal	373.8
TOTAL		28,948.9 tons

* Atlas Metal & Iron is a regional processor of metals, aluminum cans, and glass.

Special wastes, which include wet brewers grain from Anheuser-Busch, slaughterhouse wastes, and canning wastes total approximately 150,000 tons. These recycled or reused wastes are not included in the percent of wastes recycled, since they do not ordinarily contribute to the municipal solid waste stream.

Sewage sludges are included in the total wastes, since they are primarily disposed in landfills. Vallejo sewage sludges, however, are used to enrich the land for growing livestock feed and are included in the quantities of recovered/recycled materials in Table IV-1.

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APPENDIX B Resource Recovery Systems

Resource recovery has been practiced by both the public at large, refuse collectors and scrap dealers for many years. During this period of time, it has always been dependent upon the economic climate. If the price of recycled paper was high, then the separation of newspapers by the public was a popular activity. Refuse collectors would also hand-sort the refuse for cardboard, paper, aluminum, appliances, etc., if market conditions warranted this effort.

Because serious contamination of many of the potentially valuable segments occurs during storage and collection of the wastes, the materials contained in mixed municipal solid waste have little value in an unsegregated form. To increase the value of these materials, separation of the individual elements is necessary either before or after they are mixed.

With respect to contamination, although it is more desirable to segregate various waste materials at the source, this approach requires a major shift in social habits to be effective. Widespread and conscientious participation by the public on a continuing basis is required for recovery of the material to serve as a stable source of supply.

Processes for separating solid wastes have been developed through modifications of separation equipment that has been used in other industries for many years. Although more sophisticated industrial separation techniques exist, very few have been applied to solid waste processing, and historical experience of these applications is very limited. Accuracy of separation has always been a problem. Because of the heterogeneous mixture of materials in solid waste, there is always an overlap among the sorting characteristics for the different material categories such as size, specific gravity and to some extent particle shape. Even if accurately separated by density or particle size, contamination may still exist due to coatings or absorption of greases and oils. This limits the potential reuse of the materials, hence causing the market value of the recovered materials to be low. Inherently high cost of post-collection separation coupled with low market prices received are the cause of many problems associated with processing the recovered material into usable products.

The number and kinds of separated categories made available by a separation scheme are important factors in a system's usability. Some separators produce two outputs while others produce many components. Also, the kinds of materials separable in a system are important. Although it is fairly easy to magnetically separate ferrous metals, separation of the more valuable non-ferrous components is complex.

Speed of processing is an important aspect that must be balanced against the accuracy of separation. Moreover, the reliability of

a separation system will affect the economics of resource recovery according to down-time frequency and duration.

Several processes have been developed to recover the energy content of solid waste in the form of steam, electricity or fuel. Processing of these raw wastes to remove the noncombustible portion and moisture can increase the heat value from 4500 to about 7000 BTU's per pound. Coal, by comparison, has an equivalent value of from about 10,000 BTU's to 15,000 BTU's per pound. On the other hand, processed solid waste contains far less sulfur and produces less ash than coal.

Energy recovery can be compatible with the recycling of waste paper. According to EPA data, if 30% of the paper content of municipal solid waste was skimmed off for recycling, the BTU value of the remaining waste would be reduced by only 9%.

In this Appendix several categories of resource recovery systems are discussed. These resource recovery systems can be grouped into three classifications. These classifications are: source separation, front end systems and rear end systems. Each of these classifications will be discussed in detail to give a brief overview of the current "state of the art".

Because the "state of the art" of resource recovery systems is rapidly changing, it will be necessary to conduct periodic reviews of any specific plans, especially medium and long-term plans, for resource recovery of solid waste in Solano County. Not only is it likely that technological changes will take place, but the market economics for recovered materials and energy will probably undergo changes. The frequency of such reassessment reviews depend on when specific plans would be implemented. In any event, review should be conducted by the County at least as often as every three years.

SOURCE SEPARATION

Separation of the recyclable components of solid waste at the source of generation results in a clean, uncontaminated product that is easier to market at a higher price than a waste material recovered from mixed refuse. However, it does require the cooperation of the waste generators, namely residences, commercial and industrial establishments.

Residential

The most easily segregated items at households include newspapers, glass containers and aluminum and steel cans. These items are either collected by the householder and conveyed to a central collection center; collected separately from the regular refuse collection at the household by a second crew; or collected in conjunction with the regular refuse collection and placed in a separate container or rack on the collection vehicle.

Thousands of volunteer operated collection centers have been established throughout the country since Earth Day, 1970. Although these centers have collected newspapers, corrugated, glass and substantial quantities of metal containers for recycling, their primary impact has still been educational. Most of the newspapers are collected through civic organization newspaper collection drives.

Collection centers have also been established by the aluminum and glass container industries where their products can be redeemed for cash. This program has been particularly successful for the aluminum industry as the cans are easily recycled back into can stock. The industry now pays from $600 to $900 per ton (30 to 45 cents per pound) for its cans. Glass container reclamation centers are also achieving some degree of success whereby the companies pay from $30 to $70 per ton.

In some areas, newspapers have been separated at residences and collected in conjunction with the regular refuse removal service. As previously mentioned multiproduct separation and collection systems used to be commonplace. Garbage was segregated for hog feeding and glass and steel cans were separated for reuse or recycling of materials. However because of increased collection service personnel and equipment costs, most of these programs have been abandoned.

At the present time a limited amount of recycling, primarily of cans and bottles is practiced in Solano County by private beverage distributors and service organizations operating in various cities. It is estimated that approximately 3,000 tons of cardboard, 2,000 tons of newspapers, and 300 tons of glass per year are recycled in Solano County. This is only a small fraction of the cans, bottles and papers purchased by consumers and also only a few percent of the yearly litter load.

The can and bottle recycling tonnages should be increased substantially now that State legislation has passed making deposits mandatory. (AB 2020) 1986.

EPA conducted a study of source separated waste operations in several cities in the United States and arrived at the following conclusion:

> A greater degree of success was experienced in the collection of newspapers than with any other source separated material.
>
> Separate collections should be considered to be subsystem of the regular residential refuse collection system.
>
> Such programs can be initiated with a minimum of start-up costs by utilizing existing equipment and crews.

The number of households participating in a source-separation program increases the longer the program exists.

Prior to initiating a source-separation program in a community, an indepth planning and analysis must be made of market potential, methods of collection, and the necessary publicity. For long-term stability, it is imperative that a market be secured by a long-term contract guaranteeing a minimum price that will at least cover the program costs. An anti-scavenger ordinance should also be passed and enforced in accordance with the proposed program to ensure that unauthorized persons do not collect the materials and thus siphon off revenues necessary for the official program. Finally, an on-going public relations campaign should be conducted to assure continued householder participation.

Commercial and Industrial Establishments

Much of the corrugated paper wastes from retail stores is already being segregated, perhaps baled and collected at reduced rate by the refuse collection contractors or at no charge by paper stock dealers. The paper waste must be sorted properly between pickups to prevent fire hazards and rodent problems. In addition, many manufacturers have been practicing metal scrap recovery for a number of years.

Wastepaper from office buildings and computer paper can also be recovered for recycling. The mixed waste office papers can be sold separately as mixed paper for low grade uses such as roofing felt. Some office buildings have unsuccessfully tried to segregate paper wastes and non-paper or contaminated paper wastes such as cigarette packs, carbon paper and window envelopes from one another. The main problem arose from the necessary involvement and cooperation of all employees in the office building which was very difficult to obtain, as only a small percentage of contaminants could be tolerated.

FRONT-END SYSTEMS

Front-end systems can generally be classified as those that process mixed solid wastes in an effort to recover the potentially valuable material components which will be recycled as the same material. Such systems are usually required to pre-process the wastes ahead of a rear-end system which results in a directly usable output such as steam, electric power or fuel product. Front-end systems involve such operations as hand picking and sorting, shredding, air classification, wet or dry processing, magnetic separation, density separation and optical sorting.

Hand Sorting

Most hand sorting operations use a conveyor which passes the solid wastes by a group of laborers who manually pick out the valuable components. This type of operation, has a number of drawbacks. First it is not necessarily a low cost form of material

separation. Costs may range from $7.50 to $10.00 per ton just to extract corrugated containers board from waste sources that contains high percentage of corrugated. Secondly, it is a limited separation method because the pickers can usually extract only the bulky materials. Finally, there are potential health and safety hazards to the workers.

Wet Processing

In the 1970's The Black Clawson Company of Middletown, Ohio developed a system called Hydrosposal. This system was designed to process municipal solid wastes and recover metals, color sorted glass and paper fiber in a recyclable form. This system was installed in two full scale plants in New York and Florida.

For every 100 tons of waste input, the potential outputs are as follows: ferrous metals - 7 tons; paper fibers - 13 tons; color-sorted glass - 5 tons; and aluminum - 800 pounds. Combustibles are incinerated, leaving non-combustible residuals of about 10 tons that require landfilling.

The total system is composed of three sub-systems for solid waste disposal, fiber recovery and glass recovery. The first stage of the system consists of a hydropulper which is a wet grinder that pumps the incoming refuse except for large, heavy objects. Those objects are ejected and passed through a magnetic separator to recover the ferrous metal portion. The pumped wastes from the hydropulper are next pumped into a liquid cyclone which extracts small, heavy objects comprised mostly of glass intermixed with metals, wood and plastics.

Heavy material extracted by the liquid cyclone is piped to the glass recovery sub-system. The sub-system uses a magnetic separation, screening, air classification and optical sorting to produce an aluminum-rich concentrate and color sorted glass.

The pulp passes from the liquid cyclone into a fiber recovery sub-system where the pulp is screened, cleaned and dewatered. Originally, final product was to be a low grade paper fiber suitable for use in products such as roofing material. Rejected fibrous material was to be fed to a fluidized bed incinerator. The New York and Florida plants were primarily established for energy recovery by using the dewatered pulp as fuel in a boiler instead of utilizing the fiber recovery sub-system. The plants have encountered serious odor problems and low energy recovery efficiencies and now have been taken out of service.

Air Classification

Air classification is normally used as a preprocessing step in complete systems, such as for energy recovery to separate light (organic) and heavier (inorganic) wastes. Air classification can be accomplished in a number of ways. One basic concept is to pass a horizontal air flow through a falling stream of shredded solid waste materials. The heavier particles will be relatively

unaffected by the air stream while the lighter fraction will be blown laterally where they can be collected.

Another concept utilizes a rising air flow in a vertical chimney-like tube. Shredded solid waste is introduced into the side of the tube. The heavier particles settle out at the bottom and the lighter particles are carried out the top.

These concepts are dependent upon a number of physical properties that include specific gravity, shape, size and air drag coefficients. The larger air classifiers currently used for separation of solid waste materials have a capacity of about 25-35 tons per hour.

Dry Processing

Various processes have been conceived, but commercial development has largely been stymied. One such system was developed at the University of California at Berkeley for the recovery of paper fiber of sufficient quality for use in corrugated paperboard. With this system, the incoming mixed refuse is shredded and air classified to a point where a paper rich fraction is recovered. This fraction is then pulped and screened to remove the remaining non-paper contaminants. The dewatered pulp can then be used by a paperboard mill.

The Bureau of Mines, U.S. Department of the Interior, has attempted the development of a process for mechanically separating and recovering the metals, glass, paper and plastic from raw refuse. The initial step in this process is the liberation of all the materials by coarse shredding to minimize the balling of cans. Various combinations of air classification, magnetic separation, screening, optical sorting, and gravity concentration were evaluated for separating and reclaiming the individual products.

Currently, systems such as these are being commercially used to process source separated materials which are collected in combined form (e.g. newspapers, aluminum cans and glass bottles collected together)

Separation of Ferrous Metals

Magnetic separation simply uses a permanent or electromagnet to extract the ferrous metals as the solid waste stream is passed within the vicinity of the magnet. This is a fairly simple and low-cost operation which, depending upon the system configuration, can operate in the range of 75-99 percent efficiency in isolating the ferrous fraction, particularly if the waste is shredded first.

Magnetic separation of ferrous metals from a typical solid waste mix will result in the carry-over of paper and plastics caught between the magnet and the metal object. One magnetic separation system has largely overcome this problem by employing several magnets of opposite polarity over the belt rather than one. This

results in the metal object being picked up then dropped and recaught in mid air. This process culls out the tramp non-ferrous materials.

Optical Sorting of Glass

Color sorting techniques have been applied on an experimental basis in several solid waste separating systems to sort the glass rich fractions into the green, amber and flint (clear) segments. Color sorted glass has a higher value than mixed glass. In one technique (Sortex Process) each piece of glass (particle size 1/8 - 3/4 inch) is dropped in front of a light source and color-compared with a reference background. If the particles match, it falls through the sorting apparatus unaffected. If the particle is of a different color, an electronic sensing relay system activates an air jet which blows the reject over a baffle wall and into a different collection container.

Other Separation Processes

Garrett Research and Development Corporation developed a glass reclamation process aimed at recovering over 70 percent of the glass contained in municipal refuse. The recovered glass is a sand-sized, mixed color product with a purity of better than 99.7 percent. This relatively high purity is achieved by using an air classifier, screens, rod mill and a froth-flotation process. The WEMCO Division of Envirotech Corporation, Sacramento, California has developed a separator that uses water to recover non-ferrous metals and glass from the heavy fraction of air classified municipal solid waste. After air classification and removal of the ferrous content, the heavy fraction is screened to remove the fines and oversized particles resulting in a feed stock for the separator of material seized between 1/4" and 2". The separator uses a rising current of water to separate this fraction into light organic float and a heavy mixture of glass, rock aluminum and other non-ferrous metals. This heavy mixture can then be subjected to further processes for additional separation.

REAR-END SYSTEMS

Rear-end systems include such systems as incineration with heat recovery, pyrolysis and composting. These systems using chemical or biological processes, convert the organic fraction of solid wastes into directly usable products such as compost or gaseous or liquid fuel or extract energy in form of waste heat for direct utilization. Some of these processes are discussed below.

Heat Recovery

Solid wastes can be converted to recoverable heat energy through several methods. The heat may be in the form of steam or hot gases. Most heat recovery systems involve some sort of incineration. Stringent air pollution control regulations in California require these incineration systems to be equipped with the best gas clean-up devices available. In Solano County, the relatively

high cost of equipment and operating expenses, coupled with difficulties in marketing the energy product, inhibits energy recovery plant development at the present time.

There are several types of incinerators burning either raw refuse without any pretreatment or shredded and separated refuse consisting mainly of combustible materials (paper and plastics). Hot gas or stream is produced depending on furnace type. Waterwall tube boiler, tangentially fired suspension furnaces and fluid bed furnaces are being used. The steam can be used to power turbines or for heating purposes.

In addition to burning refuse for energy recovery, incineration can be used as a means of disposing of sewage sludges by co-incineration. In this process, the thermal energy of the refuse would be used to evaporate the water from the sludge to the degree necessary to combust the sludge. The moisture content of the sludge must be less than about 50 percent to maintain self-sustained combustion on a reliable basis. Both moving grate and fluidized bed furnaces can be used for incineration of refuse and sludge. Different sludges have different heat values as shown below together with refuse heating values.

Range of Heating Values, BTU/lb

Raw sludge (primary or activated dry solids)	6500-9500
Digested sludge (from anaerobic treatment, dry solids)	2500-5500
Chemical sludge (e.g. lime from tertiary treatment)	nil
Refuse (as received, 25% average moisture content)	3700-4700
Refuse (air-classified combustibles)	5000-6000

Generation of Electricity: Most plants producing electricity are mass-fired water-walled incinerators. The steam that drives the turbo-generator must be produced at a stable pressure and heat content. Numerous waste-to-energy plants are now in operation in the Eastern U.S. California will have three operating plants in 1988 (City of Commerce, Long Beach and Stanislaus County)

A 400-ton-per-day plant can produce 10 megawatts of electricity. Such a plant can handle the entire residential and commercial refuse of an area with a population of 200,000 and supply 5 to 10 percent of its total power needs.

Fuel Recovery

Rear-end systems may be used to convert the organic, combustible fraction of mixed solid wastes into a source of fuel. The systems include use of shredded solid waste as supplemental fuel or

conversion to fuels in the form of gases or oils. As with incineration heat recovery, air pollution control regulations may limit the use of fuel recovery systems in California.

The air pollution control systems comprise a substantial portion of the plant equipment. The normal California-type emission control system includes automatic combustion controls, acid-gas removal systems and a baghouse. In the future NO_x (nitrogen oxide) reduction devices may be required.

Shredded Solid Waste as Supplemental Fuel: This alternative has wider application in the mid and eastern U.S. where shredded solid wastes can be used as supplemental fuel in a coal-fired boiler. California lacks such boilers at the present thus limiting the potential of this fuel. The pelletizing of the shredded, combustible fraction of refuse has been attempted producing d-RDF in the form of pellets, briquettes and cubettes. However, the economics of this processing have not been attractive.

Pyrolysis: Pyrolysis which is often called destructive distillation, involves a process in which organic material is heated to a high temperature in a controlled low oxygen environment. The chemical breakdown of municipal solid waste results in three major product component streams: (1) a gas that can include formaldehyde, methanol, methane, propylene and ethylene; (2) a tar or oil that is liquid at room temperature; and (3) a char consisting of carbon plus inerts and mineral salts that have entered the process.

Unlike a combustion or incineration process occurring with excess air which is exothermic (liberates heat), producing primarily heat and carbon dioxide, pyrolysis is analogous to a distillation process and is entothermic (absorbs or requires heat). Because of the properties of the process, product composition can be regulated.

A number of demonstration projects involving pyrolysis have been conducted. One was a 200-TPD plant sponsored by the County of San Diego. Its key component was a flash pyrolysis unit developed by Occidental Research Corporation (formerly Garrett Research and Development Co.). The resulting product was an oil-like liquid with a heat value of about 75% that of No. 6 fuel oil. The synthetic oil was proposed to be used as supplementary fuel in an existing San Diego Gas and Electric Company oil and gas-fired boiler. A critical step in the system was the second grinding stage in which the coarse shredded combustible materials were to be reduced to a fine powder-like texture. The project never reached the reliable performance stage and was terminated.

In another project, the City of Baltimore, Maryland, attempted a 1,000 ton per day LANGARD pyrolysis plant developed by Monsanto Enviro-Chem Systems, Inc. This process converts the waste into pyrolytic gases (150 BTU/cubic foot heating value). About 7.1 gallons of No. 2 fuel oil per ton of incoming waste also must be combusted to provide heat for the pyrolysis reaction; even so,

this system will result in a net energy production. After leaving the kiln, the gases are combusted in an afterburner. The hot afterburner gases are through waste heat boilers. Major maintenance problems were encountered in the large-sized pyrolysis kiln and the process was abandoned.

The Union Carbide Corporation developed the Purox System which is a pyrolysis process involving the use of oxygen rather than air. A 200 TPD demonstration plant was placed in operation in Charleston, West Virginia. The Purox plant was to convert municipal refuse after grinding into a clean burning fuel gas and a compact, sterile residue. The key element of the system is a vertical shaft furnace. Refuse is fed into the top of the furnace and oxygen is injected into the bottom. The oxygen reacts with char formed from the refuse and generates the high temperature in the hearth needed to melt and fuse the metal and glass. This molten metal and glass drains continuously into a quench tank. The hot gases formed by reaction of the oxygen and char rise up through the descending wastes and pyrolyzes the refuse as it cools. The resultant gas is a clean-burning fuel of about 300 BTU*/cubic foot heating value. Due to the high energy requirement to produce the oxygen, this system also failed to reach commercial status.

Pilot plant studies of other pyrolysis systems have been conducted by Battelle Northwest and the University of West Virginia. In addition, laboratory studies have been conducted by the University of California (Berkeley), Bureau of Mines, Rensselaer Polytechnic Institute, and New York University.

The initial promise touted for the synthetic oils and gases produced by the pyrolysis processes are that these oils and gases could be sold as fuel substitutes or supplements. Thus, they could have a universal market since most locales could absorb those fuel types into their industrial sector at prices competitive with other fuels on an equivalent BTU basis. In addition, the oils and gases are storable and transportable, a marked advantage over "perishable" commodities, such as heat and steam. Although the marketing of the products appear quite high, the low overall economies of pyrolysis systems caused them to be impractical at the current energy market situation.

Composting

The technology of composting is well-advanced and there are no real technological barriers to making compost from solid wastes. Furthermore, compost has been found to be an excellent soil conditioner. Composting of refuse is an established practice in Europe for a small portion of its solid wastes and composting plants were established in various communities in the United States in the 1960's and 70's.

However, composting of municipal refuse in the United States has had only limited success. Of about 20 plants which have been constructed, all but 1 or 2 have closed. The major problem for the plants that closed was the lack of a viable market for the

compost. Other composting operations processing digested sewage sludge or animal manures continue in operation throughout the nation, and in fact are receiving a resurgence of interest.

There are more than 30 composting systems identified by the names of their inventors or by proprietary names. In most systems, refuse in prepared for digestion by reducing its size in various kinds of mills or grinders including hammermills, chain mills and wet pulpers. Digestion, usually aerobic, is accomplished in windrows, pits, trenches, cells, tanks, multi-decked towers or buildings and in drums or bins.

In the digestion process, micro-organisms decompose the organic portion of the refuse. The reaction is thermophilic (140-160 Degrees F) with sufficiently high temperature to destroy pathogenic organisms. At some point in the process, varying fractions of the inorganic materials are removed.

Properly managed windrows or enclosed high-rate digesting composting, either of which may also process sewage sludge with the refuse, will produce a product safe for agriculture and gardening use. The level of nutrients in compost is not high enough to meet the technical or commercial definition of fertilizer. Its main value is its high organic content. As a soil conditioner, it provides poor soils with better tilth, and improved water-holding and nutrient-holding capacities.

Mixing the solid waste with cattle manure and/or sewage sludge may result in improved fertilizer characteristics. The composting process may also be improved by increasing decomposition reaction rates, due to increased nitrogen to carbon ration.

Economically, composting does not compete on a net-cost per ton basis with landfilling and has a higher net operating cost than many of the other resource recovery systems described. It depends on readily available markets to be a viable concept.

Composting may be used in the future as a landfill avoidance technique where bulky wastes such as brush and yard trimmings (vegetative wastes component of the municipal solid waste stream) are processed. This would occur at the landfill where the compost could be used as erosion control material on covered landfill slopes.

With the very large quantities of solid municipal waste that is generated, there would never be a sufficient commercial market demand, even if the product would have desired characteristics and were cost competitive with other products sold commercially such as "milorganite" or various manures or soil amendments. Additional institutional requirements (for use in parks, golf courses, cemeteries, highway landscaping, etc.) would not add sufficient demand to warrant composting on a large scale. At best, certain agricultural waste, especially cattle manures and sewage treatment plant sludge could probably be sold commercially if composted. (it would require subsidies). Unless and until there would be a large demand for composted solid waste by the

agricultural industry, composting of municipal solid waste on a large scale is not feasible.

OTHER RECOVERY PROCESSES

Some resource recovery systems do not fit the description of either front-end or rear-end systems. One such system is discussed below:

Landfill Gas Recovery

Recently interest has developed concerning the recovery of methane from the gases generated in sanitary landfills. This involves sinking wells into the landfill and withdrawing the gases produced during the biological decomposition processes.

During the first year or so of waste decomposition, a relatively high proportion of oxygen in the fill promotes aerobic decomposition which minimizes the production of methane. But, with time, anaerobic conditions prevail, resulting in production of methane and carbon dioxide, with traces of other gases. The exact time interval until anaerobic conditions are established in a landfill will vary from site to site and is primarily controlled by the moisture content of the buried wastes.

The typical composition of landfill gas is about 50 to 55 percent methane and 45 to 50 percent carbon dioxide. The gas can be used in various ways, depending on the market requirements. It can be used in the form generated, namely a medium BTU gas 300 to 500 BTU/cu. ft.) or the noncombustible gases can be separated out yielding a high BTU gas (900 to 1000 BTU/cu. ft.)

Depending on the locale and the resulting proportion of organic material, each ton of refuse, in place in the landfill is estimated to produce a total gas volume of from 1500 $ft.^3$ of gas (750,000 BTU) to 3600 $ft.^3$ of gas (1,800,000 BTU0 over a period of many years.

In that portion of Solano County that is within the Bay Area Air Quality Management District, the landfills must capture the landfill gas to prevent it from escaping into the atmosphere. The collected landfill gas may be burned in a flare, however, it can be used as an engine fuel. At the American Canyon Landfill, serving Vallejo and Napa, such a recovery system has been installed. The engines are equipped with generators and 1.5 mega watts of electricity are produced continuously and sold to P.G. & E. Similar recovery systems will be installed in the future at the Potrero Hills Landfill and the B&J Landfill. Most large-sized landfills in California may be attractive gas generators. Normally they are deficient in moisture content and hence, gases are not being produced in as high a rate as could be sustained. Additional investigation should be made into methods of introducing liquid wastes such as sewage sludge and high nutrient-content wastes such as animal manures into these landfills to cause optimal gas production conditions to occur. Such landfill management could have additional benefits including advanced stabilization

of the landfill and an effective manner of disposal of wastewater treatment residues.

SYNOPSIS OF RESOURCE RECOVERY SYSTEMS

Various resource recovery systems have been discussed in this appendix ranging from materials recovery by hand-sorting to energy recovery. The choice of a particular system depends, of course, upon local conditions of waste production and economic conditions and most important, the availability of markets for the system's products.

The interest in recovering energy from solid wastes is resulting in the development of various waste processing systems. The leading energy recovery method is use of the direct fixed water wall furnaces and boilers referred to as "mass-fired" incinerators or waste-to-energy plants. The versions of the size most applicable to Solano County are available in modular form with furnace sizes ranging from 100 to 300 tons per day. Over the next several years, operating experience with the energy recovery systems now under construction will allow comparison of the feasibility and effectiveness of these new systems as compared to landfills and also will pinpoint those design areas where improvements are warranted.

Some of the resource recovery systems, namely a source system that would involve separation of newspapers, metals and glass and rear-end system such as an incineration process, may have applicability to Solano County.

RESOURCE RECOVERY OF SPECIAL WASTES

The preceding dealt primarily with methods for recovery of wastes normally generated by households and commercial establishments. This portion of the appendix covers categories of other waste products that do not usually enter the mixed municipal waste stream and may cause special problems. These categories include automobiles, rubber tires, white goods, waste oil and hazardous wastes.

Automobiles

The disposition of obsolete automobiles can take several forms. The auto dismantling industry acquires most of the discarded vehicles for spare parts value and sells the stripped hulks to scrap processors. A small percentage of retirements that are very old, or have no parts value, are conveyed directly to scrap processors by their final owners. Some cities and counties designate disposal sites where obsolete vehicles are accumulated prior to shipment of the dismantler, or processor. This is not practiced in Solano County.

Automobiles abandoned on public roadways are generally collected by public agencies as they present traffic problems, safety hazards, or nuisances. Vehicles abandoned in remote locations or

in locations with difficult access may be removed through special arrangements with the California Highway Patrol.

The improper disposition of obsolete automobiles presents some basic environmental and social problems. There is a degradation of the aesthetic quality of the physical environment caused by abandoned vehicles and improperly operated auto dismantling yards and storage sites. An inequitable financial burden is also imposed on the general public for collection of abandoned vehicles as collection costs are not borne by the person responsible. In addition, these vehicles represent an untapped resource which, if recycled, would reduce consumption of virgin resources and reduce the environmental damages caused by virgin materials mining and processing. Finally, there are the health and safety hazards caused by auto bodies being an attractive nuisance for children and a haven for rodents.

The steel scrap can be processed in three different ways prior to recycling after the engine, seats, and gas tank are removed:

1. Bale into bundles after the hulk is compressed into a block,

2. Slice the flattened automobile bundles into slabs,

3. Shred the auto hulk and separate the ferrous fraction magnetically.

The first two processes produce a contaminated, low-value steel scrap while the third process generally results in a higher-value material comparable to heavy melting scrap steel.

About 80 percent of the retired autos end up in auto dismantling yards. The majority of the yards acquire and inventory autos for their spare parts values, if the cost of acquisition is less than the value of the spare parts contained in that auto. After recovery of the parts, the hulk becomes dead inventory and eventually is sold to a scrap processor.

In California, there are five auto shredders with sufficient capacity to handle the hulks from the dismantling yards. The movement of the hulks into the shredders is dependent, of course, upon the price for steel scrap.

Rubber Tires

About 22 million scrap tires are generated annually in California. On the basis of vehicle registrations, Solano County would generate approximately 180,000 scrap tires yearly. The disposal and recovery of these tires present special problems. National data indicate that only about 20 percent of the tires taken out of service are recovered by being retreaded or consumed by the rubber reclaiming and tire splitting industries. The remaining 80 percent are either left on discarded vehicles, or disposed of in landfills, littered, or left to accumulate at various locations.

The relatively low recovery rate of tires is particularly significant as tires are one of the most difficult consumer wastes to dispose of properly. In sanitary landfills, whole tires cannot be as effectively compacted and tend to work their way up to the landfill surface. They also consume large volumes of landfill space and are not biodegradable. Tires littered in urban or rural areas provide nesting places for rodents and mosquitoes.

Shredding, splitting or otherwise reducing the size of tires overcomes the problems of landfilling to a large degree. Shredding is the most feasible method of physically altering the tires but is employed presently in only a few locations. Cost is the primary deterrent and neither public nor private entities are likely to pay the price of processing unless tire disposal regulations are enacted and enforced to prevent disposal by cheaper but less environmentally acceptable means. Tires are also difficult to shred. Most shredders operate at low throughput rates such as one to three tires per minute. Shredders with greater capacity (e.g., 1,000 tires per hour) cost about $100,000.

There are presently three ways to recycle rubber tires: retreading, conversion by rubber reclaimers into new products, and physical conversion by tire splitters into new products. The potential of increasing tire recovery through any of these means is limited.

Retreading can be feasible use for tires that are otherwise scrapped. Tire performance and consumer preference are two critical factors inhibiting the expanded usage of retreads. Poorly constructed retreads do not perform as well as new tires, especially at high speeds. this is primarily because the bond between the carcass and tread can fail, causing the tread to cme loose from the tire. This bond could be improved if the precise chemistry and carcass dimensions of every retreaded tire were known. However, tires of various manufacturers have slightly different chemistry or size, making the development of a perfect bonding agent and exact tread fitting difficult.

Since consumers prefer new tires and feel retreads are inferior, the manufacturers sell an increasing vaiety of low-priced new tires which, in essence, compete with retreads.

A factor which would ultimately restrict retreading is the technical suitability of old carcasses for retreading. Only about 35 percent of the discarded passenger tires are suitable for retreading. This is largely because consumers allow tires to become too worn before replacing them and because driving on underinflated tires weakens the tire carcass. Better tread bonding, leading to consistent tire performance, and consumer education and cooperation would be required to increase tire retreading.

The use of long life tires, such as radials, would also reduce the volume of scrap tires. Currently, radial tires are available that are guaranteed for 40,000 miles; with proper maintenance, these tires can last even longer. The average lifetime of bias-

belted tires is 26,000 miles. Therefore, a shift to radials would have a significant impact on reducing the amount of tire discards. Even with a continuation of long-life tires and retreading, there will be a large number of tires requiring disposal. For this reason, recovery of scrap tires is necessary. At this time, reclaiming and resplitting are two established recovery methods.

Rubber reclaiming and tire splitting are limited by the market potential for the products produced. Reclaimed rubber is not technically suitable for making new tires. The total production of other lower grade rubber products produced by reclaimers and tire splitters (e.g., door mats, hoses and belts) is extremely small compared to tire discards.

A variety of new potential means of recycling rubber tires exists and the more promising include incineration for steam production, chemical decomposition, road building and use as off-shore reefs.

Incineration of tires for steam generation in special furnaces may be the most promising manner of utilizing the scrap tires. Functioning much like municipal waste incinerators, these are water-walled furnaces, equipped with the acid gas and particulate control devices. In late 1987, a tire incineration facility was placed in operation near Westly in Stanislaus County. In this furnace, the tires are burned in whole, non-shredded form. The steam which is generated drives a turbine generator which should produce 14.4 MW of power that is sold to P.G. & E. This incinerator is being monitored closely by the state to determine whether it can meet air quality requirements.

There are three thermal conversion processes to recover chemicals from tires. Two are forms of pyrolysis. The first, destructive distillation is a low temperature degradation that yields a mixture of oils, gases and carbon residue with significant fuel value; the second carbonization, is a high temperature degradation resulting in carbon black, a major tire raw material. The third process yields hydrocarbon products that can be used in tire manufacturing.

Carbon black processing utilizing scrap rubber has proved feasible in laboratory tests conducted by some of the major rubber companies, but it is uneconomical as costs are three or four times that of conventional means from petroleum.

Destructive distillation of tires has been examined by the U.S. Bureau of Mines in conjunction with a major rubber company. The products consist primarily of heavy oils, light oils, gases and char. It has been reported the value of these products from 100 pounds of tires is approximately $1.50 or $30.00 per ton of tires processed. It has been found that even at this value the process is uneconomical if shipping, handling, storage and preparation costs are included.

Hydrogenization of the products of destructive distillation has been examined by the Hydrocarbon Research Institute at a pilot

plant and preliminary projections are that such a plant could only operate at a profit if tires could be obtained for $5.00 per ton. Therefore, a significant amount of additional investigation is needed on the process.

Road building and repair offer a large potential outlet for old shredded tires. Rubber which has been ground into small particles can be added to asphalt as a binder. The rubber is reported to enhance the resilience of the road in cool weather and reduce the flowing characteristics in hot weather. Rubber can reduce the tendency of asphalt to bleed to the road surface which presents a skidding hazard, and the rubber in the mix allows more asphalt to be added for better aging and reduced raveling tendencies. Estimated costs of adding rubber to asphalt mix (usually in concentrations of three to eight percent) range from $1.50 to $2.50 per ton of mix. The justification for this cost will depend on whether the cost can be offset by lower maintenance costs or longer road life. Tests of rubberized roads to quantify benefits are presently underway in several locations.

The State of New York is already using reclaimed rubber with hot asphalt to seal cracks and joints, and Arizona has laid rubberized asphalt on streets and airport aprons. The California Department of Transporation has for a number of years been involved in testing the use of rubber in asphalt concrete paving mixtures.

Use of tires to construct artificial reefs for fish spawning has been used on the East and Gulf coasts in response to increasing interests in sports fishing.

In California, the Department of Fish and Game has constructed reefs from scrap tires at South Humboldt Bay and Lake Perris.

In 1973, the State Assembly requested the California Department of Transportation to study the problems of tire disposal and recovery. The department reported the results of the study in January 1975 and recommended a "tire disposal tax". No specific legislation has been passed to date.

White Goods

The term "white goods" refers to major household appliances such as refrigerators, kitchen ranges, dishwashers, washing machines, clothes dryers, and hot water heaters. These items generally enter the municipal solid waste stream as bulky wastes subject to special collections. About 90 percent metallic, white goods have a fairly high recovery potential. Eighty percent of this composition by weight is ferrous metals, ten percent non-ferrous metals (copper, brass, and aluminum), and ten percent non-metallics (glass, rubber, paper, plastic and enamel).

A small number of white goods are disposed of outside the disposal system as litter. Most do enter the solid waste stream from households by one of three routes: (1) collected as bulky wastes by the solid waste collectors; (2) collected by appliance

dealers as "trade-ins" upon delivery of a new appliance; or (3) donated to service organizations such as Goodwill Industries. In the latter two instances, service life may be prolonged as the appliances may be repaired and resold, but those beyond repair are disposed of.

The recovery opportunities for those white good beyond repair are similar to those for automobiles. The non-ferrous metals and non-metallics, especially the enamel coating, must be removed as these materials are serious contaminants in the steel-making process. While a substantial portion of the non-ferrous fraction in appliances can be recovered by hand stripping, this is an economically marginal recovery option. The ferrous material has to be mechanically processed due to the enamel coating. The most economically viable process is the use of shredders coupled with magnetic separators.

As the number of shredders at transfer stations and central processing facilities increases, so will the processing and recovery of white goods, collected as a part of municipal solid waste, increase. In the absence of such facilities, white goods can be handled by automobile shredders, but the automobile shredders must possess excess capacity over the supply of automobile hulks. When excess capacity does occur, the shredder operator will need some additional source of input material in order to maintain economic viability. Appliances, being nearly the same as automobiles in composition and density, offer a good solution to shredder input shortages. The reason that appliances are not usually processed in automobile shredders is that a large quantity of white goods are necessary to produce the equivalent amount of steel as one automobile, and this requires more shredding time.

Waste Oil

Approximately 80 million gallons of waste automotive lube oil is generated annually in California. From both environmental and resource conservation considerations, current disposal practices leave much to be desired. If nationwide data are any indication, about 19 million gallons are disposed of in the State by dumping on the ground or in sewers, 29 million gallons by burning, 18 million gallons for road oil and asphalt manufactures, and 14 million gallons by re-refining.

Collection is one of the primary problems involved in waste oil recovery. The waste oil generated at service stations is regularly handled by collectors. But since the early 1960's the sales distribution of automotive lube oil has shifted dramatically from service stations to retail stores. In 1961 service stations accounted for about 70 percent of all sales of lube oil for passenger cars and mass marketers for 7 percent. By 1971 the shares were 45 percent and 28 percent, respectively, with the other 27 percent being sold by car dealers and auto supply stores.

This means that more and more consumers are changing their own oil, and that increasing quantities of waste oil are being generated at dispersed sources. A survey conducted at discount stores in Oakland, California, for a study commissioned by the U.S. Environmental Protection Agency, revealed that less than 16 percent of the respondents took their waste oil to service stations. A third dumped the oil in their backyards or elsewhere on their property. The rest of the respondents disposed of their waste oil in places such as public dumps, storm sewers, vacant lots, garbage cans, toilets and sinks. This oil is lost for any recovery scheme.

A program, Return Oil and Re-refine (ROAR), instituted in the Sunnyvale-Cupertino area to collect waste oil from those who change oil involves the establishment of several collection points. The oil collected is picked up by a re-refiner.

Waste oils used for road maintenance, weed and dust control, or oil indiscriminately dumped can cause serious environmental problems if the oil finds its way into ground and surface waters. Heavy metals, especially lead, contained in waste crankcase oils make burning, in the absence of emission control devices, a serious contributor to air pollution. Although newer and more environmentally acceptable re-refining processes have been developed, nearly all of the re-refining capacity in the U.S. is based upon the acid-clay process. This process produces about one gallon of hazardous acid-clay sludge material for every ten gallons of re-refined lube oil, creating another significant environmental disposal problem.

From a resource conservation standpoint, re-refining waste oil or using it as fuel appear to be the better alternatives. Currently, there are several re-refiners in California. During the time of the energy crisis in the early 80's, the demand for waste oil increased both as a fuel and as re-refinery base stock. As the price of oil has since dropped, the demand for waste has declined.

Even during shortages of automotive lube oil, re-refined oil suffers in the market place. On the retail shelf, it competes with low quality, non-detergent virgin oils, but good quality re-refined oil does exist. With the addition of proper additives, it can meet the warranty requirements for new automobiles. Some industrial, commercial and institutional users operating fleets of vehicles do use re-refined oil.

Labeling requirements have contributed to hamper the marketability of re-refined automotive lube oil. The Federal Trade Commission requires such oils to be labeled as "made from previously used oil". Re-refined oil entering intrastate commerce in California is now regulated under legislation adopted in this legislation:

> Provides that any lubricating oil, regardless of its origin, or any product that is a blend of recycled oil and new oil, shall meet certain specifications.

Makes it unlawful for any person to sell, offer, deliver or offer to deliver lubricating or motor oil without conspicuously marked SAE classification on container.

Deletes provisions requiring that previously used lubricating or motor oil be labeled as "made from used oil" or "re-refined used oil"; be kept separate from unused lubricating or motor oil on any basket, stand, or rack; and be the subject of separate records of purchase, sale and storage by certain persons.

Therefore, as long as re-refined oil meets the required specifications, it can be sold in California without any label reference as to its source.

An attractive route to follow to assure quality re-refined oil is via a "custom" or "closed-cycle" arrangement between a re-refiner and an industrial, commercial, or institutional fleet operator that serves both as the source of waste oil and the customer for the re-refined product. "Closed-cycle" re-refining guarantees the the re-refiner a supply of feedstock and provides an incentive for the client to prevent the waste oil from being contaminated with other oils, greases, water, etc. The re-refiner is able to secure a higher price (and margin of profit) for his production that if he had to compete on the open market against virgin oils. From the customer's point of view, "closed-cycle" re-refining both eliminates a disposal problem and decreases the cost of lubricating oil supply.

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APPENDIX C Solid Waste Disposal After a Natural Disaster

Solid Waste Management Contingency Planning for labor disputes, equipment breakdown, fuel shortage and natural disaster are outlined in the 1978 Solid Waste Plan. This appendix expands the discussion of natural disasters to focus upon the identification of sites for disposal of disaster generated debris and rubble and municipal wastes which for some reason cannot be sent to existing sites.

After the initial emergency of a major disaster subsides, it may be necessary to create emergency landfill sites for disposal of solid wastes. These would be required in the event that existing sites are inoperable, inaccessible, or due to inability to move wastes from transfer stations or directly to existing sites. Additional sites for emergency disposal of disaster generated debris and rubble may also be needed in order to mitigate possible disruption of the waste flow system. Disposal of disaster debris in existing landfills could interfere with collection, transport and disposal, or reduce capacity necessary for municipal wastes, thereby contributing potential for public health hazard by delaying or inhibiting the disposal of putrescibles.

The decision about where and when to use emergency disposal sites is best made by emergency service personnel shortly after the disaster when it is known what haul routes are open, nearby existing sites are accessible and resources available in relation to the area of damage. Waste management and handling efforts should be closely coordinated through the existing emergency services plan.

The criteria used for locating an emergency disposal site will be very similar to those which are used for siting a new long term landfill. Areas suitable for establishing new landfills have been identified and mapped Countywide. The areas identified consist of five broad zones comprising approximately 150,000 acres throughout the County. These are discussed in Chapter 2 of the

1978 plan and mapped on figure 2-3 of that document. The criteria for the zones can be summarized as follows:

1. Extensive agricultural land use. Areas designated and utilized for extensive agricultural land uses, (i.e. grazing, dry land farming, etc.) are most suitable for landfill sites. Undesirable lands having a higher potential for land use conflicts with landfills are existing or planned suburban and residential areas, intensive agricultural areas, planned recreation areas, and marshlands.

2. Shortest possible haul distance. The most suitable areas are those which are located within easy reach from urban areas, at the smallest possible distance as measured from the center of the collection area, but separated by at least one mile from existing and planned urban areas.

3. Accessibility to freeways and major state routes. Accessibility to major routes is important in order to accommodate the size and number of haul vehicles with the least amount of travel through congested areas.

4. Location close to major public roads. Landfills should be located on, or in the immediate vicinity of major public roads, for easy accessibility to the landfill and to preclude numerous heavy haul vehicles on minor or unimproved roads. However, it is undesirable, either to locate landfills with more than a 2-1/2 mile access road (due to road maintenance requirements), or to locate sites immediately adjacent to major roadways (due to public nuisance, etc.)

5. Minimize environmental constraints to siting. It is desirable to restrict the location of landfills to areas which minimize constraints to the establishment and operation of a site. Constraints include: Steep topography, flooding potential, wind and rain, slope

stability, excavation potential, soils permeability, shrink-swell potential and surface and ground water location.

A summary of soils, geologic and hydrologic constraints for the five zones is also given in Chapter 2 of the 1978 Plan. OVerall, the summary notes that mitigation for environmental constraints in the selection of a site within a given zone requires further site specific soils, geologic and hydrologic investigation (with the exception of zone five, in which site specific investigation has already been completed). Under emergency circumstances the feasibility of detailed site specific study, possible waiver of further studies, or direct implementation of clay sealing, protective levees, or other environmental constraints mitigation will need to be evaluated, in terms of the severity of the emergency, time available to establish a new site, and potential health problems.

When the determination to establish an emergency landfill is made, the location of the site within one of the five zones should be considered in relation to the type, scope, and location of the emergency situation, using the siting criteria noted. Generally, the new landfill should be sited in the designated zone closest to the area affected. The five zones described briefly below are all located within close proximity to existing urban areas. They are:

Zone 1 - The Vallejo-Benicia-Fairfield hills bounded by Elhorn Peak, I-680, Lake Herman Road and the Napa-Solano County Boundary to serve Vallejo, Benicia and the Cordelia area.

Zone 2 - The Vaca Mountains bounded by Mix Canyon Road, Pleasants Valley Road, I-80, and the Napa-Solano County Boundary to serve Vacaville and Fairfield.

Zone 3 - The North Central area bounded by Midway Road, Pitt School Road, Hawkins Road and I-80 to serve Dixon and Vacaville.

Zone 4 - The East Central area generally bounded by Fry Road, SR 113, SR-12 and Travis AFB-Southern Pacific railroad to serve Rio Vista-Fairfield and Suisun City.

Zone 5 - The Potrero Hills to serve Fairfield and Suisun City.

The establishment of an emergency landfill site for disposal of debris and rubble principally needs to consider the amount, and volume of waste, and erosion problem from disposal, for purposes of mitigating environmental constraints. Due to the potentially significant size, amount, and difficulty in compaction, site selection within a zone for this type of waste should be guided by land contours and possibility of developing deep fills with contours that can be assimilated into those existing, with as little change in surface elevation as possible.

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APPENDIX D Enforcement Program

I. Introduction

The following enforcement program for Solano County addresses the administrative, legal, technical and staff development components necessary in a solid waste plan. This enforcement program is intended to serve as guidance to the Environmental Health Services Division, which is designated the local enforcement agency for state solid waste regulations.

The Environmental Health Services Division was designated as the Local Enforcement Agency (LEA) on March 29, 1977 by the County Board of Supervisors, and was approved by a majority of the cities within the county which contain a majority of the population of the incorporated area of the county.

At the time of designation, Environmental Health was a division of the Department of Public Health. In 1983, the Division was placed under the direction of the Department of Environmental Management. In 1987, the Division moved from Vallejo and is now located at 601 Texas Street, Fairfield, CA, 94533, (707) 429-6401.

II. State, Federal, and Local Regulations

A. Authority for a Local Enforcement Agency

In Solano County the Solid Waste Enforcement Program operates by authority of the following California Codes:

Title 7.3 Government Code Section 66700 et seq (the Nejedly-Z'berg-Dills Solid Waste Management and Resource Recovery Act of 1972 and the Z'berg-Kapiloff Solid Waste Control Act of 1976);

Title 14 California Administrative Code Section 17020 et seq (California Waste Management Board Regulations).

The powers of Environmental Health Services as the Local Enforcement Agency are delineated in Title 7.3 of the Government Code:

"Section 66796.10. The enforcement agency, within its jurisdiction, shall:

1. Enforce all provisions of this chapter and the regulations adopted thereunder, and under Section 66770 pertaining to the minimum standards for solid waste handling and disposal for the protection of

air, water, and land from pollution and nuisance, and for the protection of the public health.

2. Coordinate action in solid waste handling and disposal with other federal, state, and local agencies and private persons.

3. Request enforcement by appropriate federal, state, and local agencies of their respective laws governing solid waste storage, handling, and disposal.

4. File with the California Waste Management Board, upon its request, information the Board deems necessary.

5. Develop, implement, and maintain inspection, enforcement, and training programs.

6. Adopt the enforcement program consisting of regulations necessary to implement the provisions of this chapter and the standards adopted pursuant thereto, and to establish specific local standards for solid waste handling and disposal subject to approval by a majority vote of its local governing body; provided, however, that any such regulation shall be consistent with the provisions of this title and all regulations adopted by the board. The enforcement program shall also include a description of the locally adopted procedures for carrying out the permit and inspection program.

7. Keep and maintain records of its inspection, enforcement, training, and regulatory programs and of any other official actions in accordance with regulations adopted by the board."

B. Authority of Federal Facilities

Subtitle F of the Resource Conservation and Recovery Act of 1976 makes federal facilities and agencies subject to local enforcement agencies:

"Section 6001. Each department, agency, and instrumentality of...the Federal Government (1) having jurisdiction over any solid waste management facility or disposal site, or (2) engaged in any activity resulting, or which may result, in the disposal or management of solid waste or hazardous waste shall be subject to, and comply with, all Federal, State, interstate, and local requirements, both substantive and procedural (including any requirements for permits or reporting of any provisions for injunctive relief and such sanctions as may be imposed by a court to enforce such relief), respecting control and abatement of solid waste or hazardous waste disposal in the same manner, and to the

same extent, as any person is subject to such requirements, including the payment of reasonable service charges..."

C. Local Regulations

The Environmental Health Services Division enforces the solid waste and health regulations of all local governments in Solano County. The County of Solano regulates storage, handling, and disposal of solid wastes in all unincorporated areas and permits and regulates garbage collection vehicles, septic tank pumpers, or providers of chemical toilets county-wide.

The seven incorporated Cities in Solano County set standards for solid waste handling in their municipal codes. Additionally, all provide for garbage collection by exclusive contract and include standards in agreements.

Garbage collection in the unincorporated areas is provided by private collectors. County Ordinance 1111 provides standards for collection and storage.

III. Program Objectives and Goals

A. Objective

To assure that all residential, commercial and industrial solid wastes are stored, transported and disposed of in a safe, sanitary and environmentally acceptable manner.

B. Goals

Administer the solid waste enforcement program such that the following results:

1. All disposal sites, transfer stations,and waste processing facilities are operating by authority of a current solid waste facility permit issued by Environmental Health Services.

2. All applications for new solid waste facility permits, for revision of permits to allow changes in an existing facility, or for modification of existing permits to reflect changes in findings, conditions, or data requirements will be processed in compliance with Title 7.3 of the Government Code.

3. All facility permits will be reviewed and, if necessary, revised or modified at least every five years.

4. To use the Solid Waste Information System (SWIS) inspection form for all solid waste facility inspections.

5. Local ordinances and agreements will be in compliance with the state minimum standards for storage and collection of solid wastes.

6. To participate in updating the County's Solid Waste Management Plan every three years.

IV. Solid Waste Facility Permitting Procedures

A. Permit Preparation

Permits for solid waste facilities in Solano County are based on information provided in the Application for a Solid Waste Facilities Permit. Part of the permit application is the Report of Disposal Site Information or a Report of Station Information. This information is submitted by the applicant to the Environmental Health Services Division. The information provided is reviewed by the Division and verified by a facility inspection. A Solid Waste Facilities Permit is then prepared using the California Waste Management Board format.

B. Submission To CWMB

After preparation, a copy of the proposed permit is furnished to the applicant for review and comment. The proposed permit is then submitted to the California Waste Management Board for concurrence.

C. Denial and Appeal

If the Solano County Environmental Health Services Division or the California Waste Management Board determines a violation of the state statutes or standards exist, the permit shall be denied. The applicant may file an appeal with Environmental Health Services who shall then submit the appeal to the Board of Supervisors, sitting as the Hearing Panel. All appeal procedures shall be carried out in strict compliance with Title 7.3 of the Government Code and with the Administrative Procedures Act.

D. Revision

Permits are revised whenever a significant change in facility design or operation is proposed by the operator. Permits are reviewed annually to ensure that the facilities are in compliance with the conditions of those permits.

E. Modification

Permits may be modified when it has been determined that an existing permit no longer provides pertinent data in the findings, in the conditions, or in the monitoring data that is necessary for the protection of the public health of the environment.

F. Closure Requirements

When the Environmental Health Services Division becomes aware of a proposed solid waste facility closure, written notification is given the disposal site operator and owner of the closure procedures and requirements.

Closure requirements include notification to Environmental Health Services a minimum of 90 days prior to completion or suspension of work at the disposal site. The Regional Water Quality Control Board must also be notified at least 90 days prior to actual closure. A detailed description of the site must be filed with the County Recorder, the County Solid Waste Plan Coordinator, and the Environmental Health Services Division.

The Environmental Health Services Division will monitor the site to identify and abate problems that may develop.

G. Records

The Environmental Heath Services Division maintains facility records and documents along with general correspondence and inspection records.

V. Inspection and Compliance Procedures

A. Vehicles

The department inspects all solid waste collection and/or transportation vehicles at least once annually and informs the owner of the results.

B. Facilities

The department inspects solid waste disposal and transfer facilities at least 12 times per year using the SWIS inspection form. Prior to an inspection, the inspection staff reviews the facility permit, correspondence and last three inspection records. All facility inspections are unannounced, but during normal operating hours. After the inspection, department staff makes a verbal report to the operator or to his representative, detailing the results of the inspection. A written report is prepared and provided to the operator. The department files the inspection sheet and

written report in the facility files, where they are maintained for six years, and forwards copies of each inspection to CWMB. Records of individual facility files contain all materials correspondence, forms, etc.

C. Compliance

Environmental Health Services Division compliance program actions are:

1. Verbal Notice: To storage, collection or facility operators at the time that a violation is identified. A verbal order is confirmed in writing and mailed or hand delivered to the violator or his representative.

2. Written Notice: Usually transmitted by mail; may be issued by the field investigator at scene of violation.

3. Office "Show Cause" Hearing: Administrative hearings conducted by the Program Manager, Environmental Health Services Division, providing the violator an opportunity to present evidence of compliance to avoid further enforcement procedures.

4. Notice and Order: Prepared and served as provided for in Title 14, California Administrative Code, Chapter 5 (within 5 days of the date of issuance, a copy of the Notice and Order document is transmitted to the California Waste Management Board). Compliance or non-compliance with a Notice and Order is determined by inspections, letters of compliance or non-compliance issued by other participating agencies, and certification of compliance by the company's engineer or other appropriate persons.

D. Complaints

The Environmental Health Services Division investigates written or verbal complaints that solid waste services or facilities are the source of health or environmental hazards or a public nuisance, including anonymous complaints. The department records complaint and investigation results on its forms and may issue an official notice and/or abatement order if the complaint is verified. The department may obtain inspection or search warrants if entry onto the property is refused. The department provides the complainant with results of the investigation. Failure to comply with an official notice and/or abatement order is referred for legal enforcement action.

E. Coordinating Agencies

The following State and local agencies are closely coordinated in enforcement responsibilities and activities:

1. California Waste Management Board: Sets State policy, establishes statewide standards, concurs with or objects to solid waste facility permits and aids, assists, and oversees local enforcement programs.

2. State Department of Health Services, Toxic Substances Control Division: Regulates and permits hazardous and infectious waste transportation and disposal.

3. County and City Planning Departments: Establish land zoning and process land use permits.

4. County and City Public Works Departments: May control the use of City or County streets, determine off-site drainage courses and structures, and collect street refuse.

5. County and City Building Departments: Issue permits for structures at solid waste facility sites.

6. State, County, City or Special Districts are responsible for fire control at solid waste facilities.

7. Regional Water Quality Control Boards: Issue waste discharge requirements for solid waste disposal sites, and determines disposal site classifications.

8. San Francisco Bay Conservation and Development Commission (BCDC): Regulate disposal sites and other projects near Solano County's marshland.

VI. Staff Training

The Environmental Health Supervisor is responsible for all aspects of the local enforcement program. He and his staff are expected to be knowledgeable in the following areas:

A. Codes, minimum standards, local ordinances.

B. Individual permit content and requirements.

C. Inspection schedules and techniques.

D. Field and office report preparation.

E. Preparation for hearings.

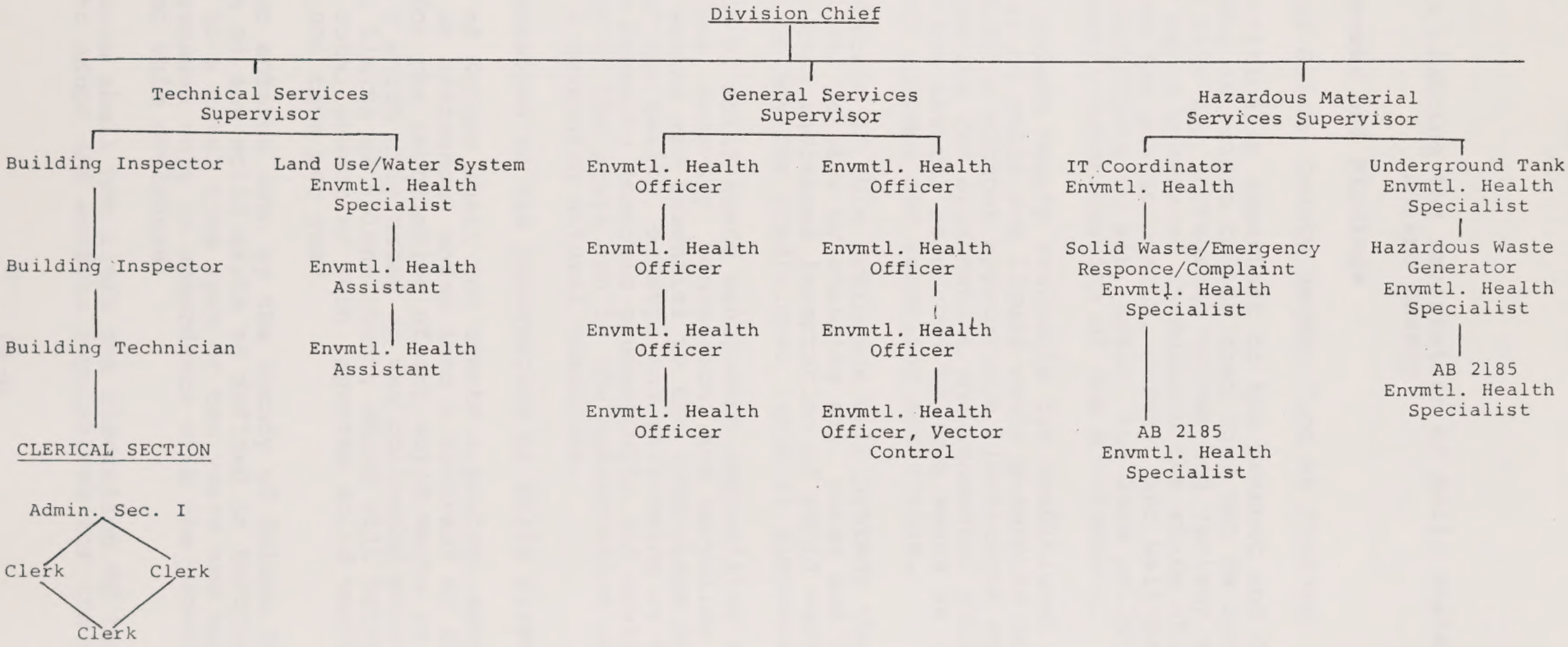
VII. Table of Organization

(See attachment)

ENVIRONMENTAL MANAGEMENT

Table C 1

ENVIRONMENTAL HEALTH SERVICES DIVISION



DRAFT June 24, 1986

APPENDIX E

An Ordinance Limiting the Importation of Solid Waste into Solano County

Section 1: Purposes and Findings

The people of Solano County hereby find as follows:

A. It is critically important to the present and future residents of Solano County that they not be burdened unduly with the increasing volume and variety of solid wastes being generated throughout the state which threaten the public health, safety, and well-being and which contribute to air, water, and land pollution and the general deterioration of the environment.

B. Making Solano County available for traditional land disposal of solid and liquid waste generated outside its jurisdiction without appropriate limitations acts as a disincentive for eliminating environmental pollution and conserving natural resources by such means as resource recovery systems and recycling activities.

C. The policies of this ordinance will protect the public health and welfare by avoiding air, water and land pollution from increased importation of solid waste to Solano County for traditional landfill disposal.

D. Methods of solid waste management emphasizing source reduction, recovery, conversion, and recycling of all solid wastes are essential to the long-range preservation of the health, safety, and well-being of the public to the County's economic productivity and environmental quality of the state and to the conservation of the state's remaining natural resources.

Section 2: Limitation on the Importation of Solid Waste

The County of Solano shall not create a policy, adopt a resolution or ordinance, enter into a contract or in any manner allow for the importation of any solid waste as defined in Section 3 which originated or was collected outside the territorial limits of Solano County which will bring the cumulative total amount of such imported solid waste in excess of 95,000 tons per year.

Any contract entered into by the County of Solano for the importation of any solid waste as defined in Section 3 shall be limited to a total time span of ten years and may be extended or renewed only in accordance with the provisions of Section 4 of this ordinance.

This ordinance shall not limit the discretion of the County of Solano to adopt and enforce regulations for the disposal

and handling of less than 95,000 tons of solid waste as defined in Section 3 generated outside of the County of Solano or any solid waste generated inside the County. Furthermore, this ordinance shall not affect the existing contract entered into between the City and County of San Francisco and Solano County allowing importation of garbage during the years 1988-1993.

Section 3: Definition of Solid Waste

For purposes of this ordinance, "solid waste" means all putrescible and nonputrescible solid, semisolid and liquid wastes, including garbage, trash, refuse, paper, rubbish, ashes, industrial wastes, demolition and construction wastes, abandoned vehicles and parts thereof, discarded home and industrial appliances, manure, vegetable or animal solid and semisolid waste. "Solid Waste" as used in this ordinance shall not include hazardous waste.

Hazardous Waste means a waste, or combination of wastes, which because of its quantity, concentration, or physical, chemical, or infectious characteristics may either:

(a) Cause, or significantly contribute to, an increase in mortality or an increase in serious irreversible, or incapacitating reversible illness;

(b) Pose a substantial present or potential hazard to human health or environment when improperly treated, stored, transported, or disposed of, or otherwise managed.

Section 4: Increases in Amount and Duration of Contracts

The cumulative total amount of solid waste authorized by this ordinance for import into the County of Solano or the ten year limitation upon such contracts for importation shall not be amended without approval by a majority of the people voting in a county-wide election.

Section 5: Severability

If any portion of this ordinance is declared invalid, the remaining portions are to be considered valid.

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